



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**A CASE STUDY OF PROJECT ATHENA: TACTICAL
LEVEL TECHNOLOGICAL INNOVATION ABOARD
THE *USS BENFOLD***

by

Christopher K. Cannon

December 2014

Thesis Advisor:
Second Reader:

Frank J. Barrett
Tarek K. Abdel-Hamid

Approved for public release; distribution is unlimited

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE December 2014		3. REPORT TYPE AND DATES COVERED Master's Thesis
4. TITLE AND SUBTITLE <i>A CASE STUDY OF PROJECT ATHENA: TACTICAL LEVEL TECHNOLOGICAL INNOVATION ABOARD THE USS BENFOLD</i>			5. FUNDING NUMBERS	
6. AUTHOR(S) Christopher K. Cannon			8. PERFORMING ORGANIZATION REPORT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A				
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number: NPS.2014.0040-IR-EM2-A				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			12b. DISTRIBUTION CODE	
13. ABSTRACT (maximum 200 words) The Department of Defense (DOD) must find a way to maintain its technological superiority during this dawning era of fiscal austerity. As the wars in Iraq and Afghanistan end and defense budgets shrink, the DOD can no longer rely solely on the commercial sector to address its technological problems. Instead, the DOD must harness the intellectual capital resident in its ranks to identify and solve its most salient technological challenges. An innovation effort initiated aboard the <i>USS Benfold</i> exemplifies ways in which tactical level units can drive technological innovation within the DOD. The initiative, known as Project ATHENA, began in early 2013 as a way to develop junior officers aboard the <i>USS Benfold</i> . However, Project ATHENA grew over the following months into an innovation initiative that is now supported by leading academic institutions, the commercial sector, private enterprise, and a growing number of government agencies. Project ATHENA offers an opportunity to conduct a case study analyzing the ways in which organizational change management and design thinking can be utilized to spur technological innovation. The case provides DOD leaders with an in depth examination of the factors contributing to the burst of technological innovation witnessed in project ATHENA.				
14. SUBJECT TERMS Design Thinking, Innovation, Organizational Change Management, Case Study			15. NUMBER OF PAGES 169	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU	

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

**A CASE STUDY OF PROJECT ATHENA: TACTICAL LEVEL
TECHNOLOGICAL INNOVATION ABOARD THE *USS BENFOLD***

Christopher K. Cannon
Lieutenant Colonel, United States Marine Corps
B.S., University of California, Davis, 1997

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

from the

**NAVAL POSTGRADUATE SCHOOL
December 2014**

Author: Christopher K. Cannon

Approved by: Frank J. Barrett
Thesis Advisor

Tarek K. Abdel-Hamid
Second Reader

Dan Boger
Chair, Department of Information Sciences

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

The Department of Defense (DOD) must find a way to maintain its technological superiority during this era of increasing fiscal austerity. As the wars in Iraq and Afghanistan end and defense budgets shrink, the DOD can no longer rely solely on the commercial sector to address its technological problems. Instead, the DOD must harness the intellectual capital resident in its ranks to identify and solve its most salient technological challenges.

An innovation effort initiated aboard the *USS Benfold* exemplifies ways in which tactical level units can drive technological innovation within the DOD. The initiative, known as Project ATHENA, began in early 2013 as a way to develop junior officers aboard the *USS Benfold*. However, Project ATHENA grew over the following months into an innovation initiative that is now supported by leading academic institutions, the commercial sector, private enterprise, and a growing number of government agencies.

Project ATHENA offers an opportunity to conduct a case study, analyzing the ways in which organizational change management and design thinking can be utilized to spur technological innovation. The case provides DOD leaders with an in-depth examination of the factors contributing to the burst of technological innovation witnessed in project ATHENA.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	PURPOSE.....	1
B.	BACKGROUND.....	1
C.	PREVIOUS RELATED RESEARCH.....	3
D.	PROBLEM STATEMENT.....	7
E.	PURPOSE STATEMENT.....	8
F.	RESEARCH QUESTIONS.....	8
G.	RESEARCH METHODS.....	8
H.	PROPOSED DATA, OBSERVATION AND ANALYSIS METHODS.....	9
I.	POTENTIAL BENEFITS AND LIMITATIONS.....	9
II.	LITERATURE REVIEW.....	11
A.	INTRODUCTION.....	11
B.	THE CASE STUDY METHOD.....	12
1.	Introduction.....	12
2.	Qualitative Research: Background.....	12
3.	Qualitative Methods: Selection.....	13
4.	The Case Study: Design and Execution.....	13
5.	Case Study Research: Problems and Solutions.....	15
6.	Conclusion.....	16
C.	ORGANIZATIONAL CHANGE MANAGEMENT.....	17
1.	Introduction.....	17
2.	Historical Change Management Theories/Concepts.....	17
a.	<i>Unfreeze-Change-Refreeze.....</i>	<i>17</i>
b.	<i>The Change Formula.....</i>	<i>19</i>
c.	<i>The Eight-Step Change Process.....</i>	<i>21</i>
3.	Contemporary Change Management Theories/Concepts.....	24
a.	<i>Pace, Sequence and Linearity.....</i>	<i>24</i>
b.	<i>Small Steps Leading to Radical Changes.....</i>	<i>25</i>
c.	<i>Change from Within.....</i>	<i>26</i>
4.	Conclusion.....	27
D.	DESIGN THINKING.....	28
1.	Introduction.....	28
2.	The Evolution of Design Thinking.....	28
a.	<i>Industrialism versus Individualism.....</i>	<i>28</i>
b.	<i>Design Thinking and Business Management.....</i>	<i>29</i>
3.	Design Thinking Theorists and Design Thinking Business Applications.....	30
a.	<i>Herbert Simon.....</i>	<i>30</i>
b.	<i>Roger Martin.....</i>	<i>30</i>
c.	<i>Tim Brown.....</i>	<i>33</i>
4.	Conclusion.....	36
E.	LITERATURE REVIEW CONCLUSION.....	36

III. CASE STUDY.....	39
A. CDR LEBRON.....	39
B. LT NOBLES.....	41
C. THE “WIKI WARDROO” PITCH	42
D. “WIKI WARDROOM”.....	44
1. Introduction.....	44
2. Run-Up to “Wiki Wardroom”	44
3. Event Overview	45
4. Event Highlight: SWO Payback Tour	46
5. Initial Reactions and Proposed Changes	47
6. Conclusions.....	50
E. ATHENA II	50
1. Introduction.....	50
2. Run-Up to the Event	51
3. Event Overview	51
4. Event Highlight: The EARS Concept	52
5. Growing Enlisted Participation	54
6. Conclusions.....	55
F. CONNECTIONS AND GROWTH: KEY ANCILLARY EVENTS	
PART 1.....	55
1. Introduction.....	55
2. NWDC and the CRIC.....	56
3. IDEAFEST.....	56
4. Josh Kvavle and SPAWAR.....	57
5. The Surface Navy Association West Coast Symposium.....	59
6. Conclusion	60
G. PROJECT ATHENA RISKS.....	60
1. Introduction.....	60
2. Venue Risk.....	61
3. Vendor Risk.....	62
4. Risk Mitigation.....	62
5. Conclusion	63
H. ATHENA III.....	64
1. Introduction.....	64
2. Run-Up to the Event	64
3. Event Overview	65
4. Event Highlight A: The ODIN Concept.....	67
5. Event Highlight B: The SCAT Heads-Up Display (HUD) Concept	69
6. Event Highlight C: The Cosmogator Concept	72
7. Conclusion	74
I. CONNECTIONS AND GROWTH: KEY ANCILLARY EVENTS	
PART 2.....	75
1. Introduction.....	75
2. The Silicon Valley Trip: “Milicon Valley”	75

3.	The Learn Warfighter Needs Workshop	76
4.	The AFCEA Brief	79
5.	Dinner with Rear Admiral Rowden	80
6.	Conclusion	80
J.	ATHENA IV	81
1.	Introduction	81
2.	Event Overview	81
3.	Event Highlight A: The Tankless Water Heater Concept	83
4.	Conclusions	86
K.	COMMANDER DAY	86
L.	ATHENA V	87
1.	Introduction	87
2.	Run-Up to the Event	87
3.	Event Overview	88
4.	Event Highlight A: The Internship for Sailors Concept	92
5.	Conclusions	93
M.	ATHENA FUTURE	94
1.	Introduction	94
2.	ATHENA Pillars	94
3.	ATHENA East	95
4.	The White House	95
N.	PROJECT ATHENA: QUANTITATIVE OUTPUTS	97
O.	PROJECT ATHENA: QUALITATIVE OUTPUTS	101
1.	Introduction	101
2.	Culture Shift: “Milicon Valley”	101
3.	Remaining Challenges: Silos of Support	106
4.	Conclusion	107
P.	CONCLUSION	108
IV.	ANALYSIS OF FINDINGS	111
A.	INTRODUCTION	111
B.	ORGANIZATIONAL CHANGE MANAGEMENT	111
1.	Kotter’s Change Process	111
2.	Pace and Linearity of Change	114
3.	The Leader’s Role in Organizational Transformation	116
4.	Change and Embeddedness	117
5.	Change Management Applications within the DOD	118
C.	DESIGN THINKING	119
1.	Problem Framing	120
2.	Efficiency vs. Innovation: The Knowledge Funnel	121
3.	Strategies for Navigating Innovation Spaces	123
4.	Design Thinking Applications Within the DOD	125
5.	Conclusions	126
V.	CONCLUSION	127
A.	CONCLUSIONS	127
B.	RECOMMENDATIONS FOR FURTHER RESEARCH	128

APPENDIX A: WIKI WARDROOM BRIEF.....	131
APPENDIX B: LEARN WARFIGHTER NEEDS HANDOUT.....	137
LIST OF REFERENCES	151
INITIAL DISTRIBUTION LIST	153

LIST OF FIGURES

Figure 1.	Robert Yin’s six-step case study model (from Yin, 2009).	14
Figure 2.	Kurt Lewin’s change model (from https://www.digitalmethods.net/MoM/CaseStudy#_ftn5).	19
Figure 3.	John Kotter’s eight-step change model (from http://www.pisma.com.au/?publication=2012-nay-gsdi13-paper).	23
Figure 4.	Roger Martin’s knowledge funnel (from Martin, 2009)	33
Figure 5.	The three spaces of innovation (from Brown, 2009)	34
Figure 6.	Design thinking mental states: Diverge and Converge (from Brown, 2009) ..	35
Figure 7.	<i>Benfold</i> JOs discussing ideas at the first “wiki wardroom” event (from Nobles, 2013)	47
Figure 8.	“Wiki wardroom” attendees discussing a new event name (from Nobles, 2013)	49
Figure 9.	One of 12 “Pitches” presented at ATHENA II (from Nobles, 2013)	52
Figure 10.	A researcher from the USC-ICT conducts a demonstration on an EARS prototype (from Nobles, 2013)	54
Figure 11.	Team ODIN pitching their idea at ATHENA III (from Nobles, 2013)	67
Figure 12.	LT Hughes pitching Cosmogator (from Nobles, 2013)	74
Figure 13.	<i>Benfold</i> crew and SPAWAR scientists at the Learn Warfighter Needs Workshop (from Nobles, 2014)	77
Figure 14.	A ‘pitch’ at the Learn Warfighter Needs Workshop (from Nobles, 2014)	79
Figure 15.	ATHENA IV question and answer session (from Nobles, 2014)	82
Figure 16.	The crowd listening to ENS Baker’s ‘pitch’ (from Nobles, 2014)	85
Figure 17.	LT Nobles kicks off ATHENA V (from Nobles, 2014)	89
Figure 18.	Prototype demonstration of an ATHENA IV idea (from Nobles, 2014)	90
Figure 19.	Electrical Safety Tool: current (left) and recommended (right) (from Nobles, 2014)	91
Figure 20.	The Goddess ATHENA (from Nobles, 2014)	109
Figure 21.	Linear growth graph (from http://maths.mq.edu.au/texdev/MathSymp/Tuck/node2.html)	116

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF ACRONYMS AND ABBREVIATIONS

AFCEA	Armed Forces Communication and Electronics Association
ARCI	Acoustic Rapid Commercial of the shelf Insertion
C2	Command and Control
CDR	Commander
CNO	Chief of Naval Operations
CO	Commanding Officer
COTS	Commercial Off the Shelf
CRIC	CNO's Rapid Innovation Cell
DOD	Department of Defense
EARS	Environmental Acoustic Recognition System
ENS	Ensign
FC	Fire Controlman
FCC	Chief Fire Controlman
GPS	Global Positioning System
HFC	Chief Hospital Corpsman
JO	Junior Officer
LCDR	Lieutenant Commander
LT	Lieutenant
LTJG	Lieutenant Junior Grade
MBA	Master of Business Administration
NPS	Naval Postgraduate School
NSO	National Sport Organization
NWDC	Navy Warfare Development Command
ODIN	Optical Database and Information Network
RDT&E	Research Development Testing & Evaluation
SCAT-HUD	Small Craft Action Team Heads Up Display
SNA	Surface Navy Association
SPAWAR	Space and Naval Warfare Systems Command
ST	Sonar Technician
S&T	Science and Technology

SWO	Surface Warfare Officer
TANG	Tactical Advancements for the Next Generation
USC	University of Southern California
USC-ICT	USC Institute for Creative Technologies
XO	Executive Officer

I. INTRODUCTION

A. PURPOSE

There is a lack of case study research describing the process of technological innovation within the Department of Defense (DOD). This thesis will address that gap through examination of project ATHENA, which is a grassroots innovation effort initiated aboard the *USS Benfold* (DDG 65).

This researcher will use the case study method to chronicle project ATHENA from its inception in early 2013 to the present day. Through interviews and direct observation of ATHENA participants, the researcher will attempt to identify the ways in which the principles of design thinking and organizational change management can be applied to improve technological innovation at the small unit (i.e., Battalion/Squadron/Ship) level.

Specifically, the researcher will examine the interplay of the people and processes involved with project ATHENA, and identify factors that contributed to the project's effectiveness. The goal is to produce a DOD-specific case study that can aid DOD leaders seeking to improve technological innovation at the tactical unit level.

B. BACKGROUND

As the wars in Iraq and Afghanistan come to a close and defense budgets shrink, the Defense Department faces a conundrum—how to maintain its competitive advantage in cutting edge technology while simultaneously grappling with reduced Research and Development resources. The answer is simple: the DOD must learn to innovate. No longer can large sums of money be thrown at contractors to identify and create technological solutions to the DOD's problems. Instead, during this era of fiscal austerity, the DOD must learn to harness the intellectual capital resident in its ranks to identify and solve its most relevant technological challenges.

Fortunately, the increasing education, experience and technological know-how of service members and DOD civilians provide an intellectual landscape full of creative

potential. The challenge will be in successfully coupling this need to remain technologically innovative with the skill sets to innovate from within the ranks. The tools and processes that can transform innovation potential into actualized new solutions already exist, and have been explored in-depth in academia and the commercial sector for decades.

Creating an innovative unit requires two fundamental elements: an innovation process, and an innovation-friendly organizational environment. The field of design thinking offers DOD leaders an innovation process that focuses on methods to unlock the creative potential of both individuals and organizations. Design thinking seeks to identify the most critical problems and devise optimal solutions to those problems through understanding the needs and requirements of all stakeholders. It maximizes human participation in all facets of the design process and relies heavily on communication, empathy, and creativity to foster innovation.

However, in order for the ideas and innovations created in the participative design process to stick (instead of becoming just another good idea that never materializes), a culture of innovation has to be in place. Creating this environment, particularly within the traditionally rigid, hierarchical and risk-averse military culture requires significant organizational change. The field of organizational change management offers DOD leaders a methodology for implementing changes that last. Change management theories provide insights about major inhibitors to change, such as culture and identity, and offer techniques to overcome these obstacles.

Together, the fields of design thinking and organizational change management offer principles and processes that can help units within the DOD improve their ability to innovate. Unfortunately, while the tools needed to create cultures of innovation exist, there is very little documentary evidence chronicling their use within the DOD. Thus, DOD leaders must turn to the business world to learn about these processes and how they can be applied within their organizations. This situation is unsatisfactory, given the differing missions and objectives of the commercial sector and the DOD.

C. PREVIOUS RELATED RESEARCH

This research builds on previous research undertaken by several Naval

Postgraduate School (NPS) students who studied how design thinking and organizational change management can help foster technological innovation within the DOD. While each thesis addressed slightly different aspects of the design thinking and organizational change paradigms, they collectively provided the baseline for this researcher's inquiry into project ATHENA. There were three critical theses conducted over the past two years which are germane to this research effort.

1. A Case Study of Innovation and Change in the U.S. Navy Submarine Fleet (2012) by Lieutenant Commander Thomas Hall (U.S. Navy)

Throughout 2012, LCDR Hall investigated an innovation effort initiated through the U.S. Navy's submarine force. The initiative, which would become known as the Tactical Advancements for the Next Generation (TANG), was designed to improve the situational awareness interfaces and sonar systems aboard submarines.

LCDR Hall had experienced life aboard submarines earlier in his career, and his interest in TANG was spurred by two aspects of this initiative. First, the process by which problems were identified and solutions developed was unprecedented — it was not customary for the submarine force, or the Navy in general, to use design thinking as a basis for problem solving. Second, the decision to use an external agency to assist with the project, and the unique partnership that was formed between the Navy and the commercial agency IDEO, represented a mold-breaking move signaling a potential paradigm shift within the DOD (LCDR Hall, 2012).

The express purpose of TANG was to improve submarine technology by leveraging the technological acumen and know-how of the junior Sailors who interacted with the equipment on a daily basis. It was a deliberate move to tap the knowledge and unique perspective of the end users, and solicit their ideas on identifying the problems and their solutions. The Navy, however, realized that it lacked the design thinking and innovation skills necessary to pull off this audacious effort single-handedly. So, it

decided to partner with IDEO, perhaps the most highly regarded commercial design firm in the world, to lead the TANG initiative.

Once on board in November 2011, IDEO implemented its signature blend of design thinking and participative design methodology to facilitate brainstorming and ideation sessions. The members of the TANG forum (IDEO, junior enlisted submariners, and key Navy representatives) met daily for a week in early 2012 to uncover several high-impact problems with visual display systems in submarine control rooms and to develop unique technological solutions to address them. While many of the solutions were ultimately rejected, there are several currently under development with the potential to impact the entire submarine force (LCDR Hall, 2012).

This IDEO-led approach represented a significant shift from the traditional methodology used by the Navy to develop technology. The current process often uses very little junior Sailor input and typically produces systems that are cumbersome and unapproachable for its end users (LCDR Hall, 2012). At TANG, however, IDEO employed junior Sailors early in the design process and allowed them to have a say in the design and functionality of the technology that they are ultimately responsible for operating.

However, all was not smooth sailing at TANG. TANG's novel approach to innovating required that the submarine community break from its highly formalized culture that stresses procedural compliance and safety above all else. The combination of injecting junior Sailors and IDEO into the technology design process required persistent effort on all parties involved to work past preconceived notions and outdated cultural norms.

It was precisely the tension caused by these competing forces — the traditional versus design thinking methodologies used for innovation and the formal risk-averse submarine culture versus the easy going participative IDEO culture — that highlighted the organizational change dynamic that must be considered within the context of innovation. LCDR Hall focused a great deal of his research on understanding the interplay between these two forces, and the successful resolution to these often-competing factors played a large part in TANG's success (LCDR Hall, 2012).

The overwhelmingly positive reaction from the TANG participants indicated to the Navy just how effective the design thinking process was in identifying and solving technological challenges (LCDR Hall, 2012). Consequently, the Navy decided to expand the TANG initiative by supporting a second event in September 2013, which became the subject of another NPS thesis (described below). However, before this thesis research was completed, another NPS student researched the original TANG event, but from a slightly different perspective.

2. A Case Study for Managing Information Technology through Design (2013) by Major Michael Gavin (U.S. Marine Corps)

Maj Gavin's thesis centered on the first TANG event; however, he studied it from the aspect of the Defense Acquisition process. As a student in the Acquisition curriculum, Maj Gavin was interested in how the unique blend of participative design methodology and organizational change management employed at the first TANG event could be used to improve the requirements generation process.

Inadequate requirements are frequently cited as a fundamental contributor to the laborious and often-disappointing acquisition process. While entire text books are filled with potential solutions to this persistent problem, Maj Gavin theorized that design thinking and organizational change management could be key to a long term solution. Thus, his research centered on the critical technological problem the submarine community was seeking to address at TANG and how their approach using design thinking and organizational change could be applied to the DOD requirements generation process in general (Maj Gavin, 2013).

The submarine community's chief problem that emerged at the TANG event was how to field state-of-the-art sonar technology seamlessly and cost effectively. During the Cold War, sonar technology was largely funded and developed from within the military's expansive industrial base. However, when the Cold War ended, funding dried up and the submarine community turned to commercial-off-the-shelf (COTS) sonar technology to keep pace with the technologies employed by America's adversaries (Maj Gavin, 2013).

Eventually, the Navy formalized this program, naming it the Acoustic Rapid Commercial of the shelf Insertion (ARCI) program. Although ARCI was highly

successful in fielding the best available sonar technology quickly, it had a serious drawback. The support and training requirements needed to keep up with the continual technology upgrades lagged far behind the technology itself. Thus, the cascading effects of the upgrades caused a multitude of problems such as poorly trained users and an inadequate support infrastructure (Maj Gavin, 2013).

Maj Gavin's research led him to conclude that the sustainment issues experienced in the ARCI program could be mitigated by employing a comprehensive requirements generation methodology similar to the one used at the first TANG event. The unique interaction of end users and innovation experts that occurred at the event resulted in clearly defined requirements that outlined both fielding and sustainment requirements that were actionable when applied to the Defense Acquisition process. Maj Gavin went on to provide recommendations detailing how this process could be made reproducible, thereby improving the entire Defense Acquisition process (Maj Gavin, 2013).

3. A Case Study of Introducing Innovation through Design (2014) by Captain Robert Featherstone (U.S. Marine Corps) and Lieutenant Kevin Johnston (U.S. Navy)

In 2014, Capt Featherstone and LCDR Johnston added to the growing body of case study research centered on the TANG initiative by conducting their thesis research on the second TANG event. The four-day long event, which became known as the Executive TANG forum, was held in September 2013 at the U.S. Naval Station, Pearl Harbor.

The purpose of the second TANG event was similar to the first: Use a participative design process – in which technology users are inserted early in the design process – to identify problems and develop technology-based solutions. The key difference between the two events was the participants. While the first TANG event focused on Junior Sailors who worked in the submarine's control room, the second TANG event targeted current and post-command submarine Captains. The goal was to utilize their perspectives and experiences to understand the unique challenges of command at sea and to address these challenges through technology (Capt Featherstone & LCDR Johnston, 2014).

Both researchers attended the Executive TANG forum, and conducted extensive interviews with many of the key players involved in the initiative. The event was run in a

manner similar to the first event, with IDEO facilitating the initiative and orchestrating daily activities. Forum participants, working under the expert guidance of IDEO facilitators, identified several command-related challenges and developed eleven potential technological solutions to these recurring issues. Currently, these concepts are under development and several are expected to be fielded to the submarine force within the next few years (Capt Featherstone & LCDR Johnston, 2014).

After months of post-event research and analysis, the researchers concluded that the key to successful technological innovation lies in combining an innovation process with a change management process. Specifically, they posited that an innovation process like the design thinking methodology utilized by IDEO was highly applicable within the DOD for improving technological innovation. Furthermore, they felt that using a change management process in tandem with an innovation process was critical in enabling the technology developed through the innovation process to be adopted within the organization (Capt Featherstone & LCDR Johnston, 2014).

The researchers concluded their thesis by calling for future research on the TANG initiative—specifically, the third event known as the Surface TANG. The Surface TANG, scheduled for late 2014, was designed to expand the TANG initiative to the surface Navy. The researchers also recommended investigation into a grassroots innovation effort underway in San Diego aboard the *USS Benfold* called project ATHENA (Capt Featherstone & LCDR Johnston, 2014). Fortunately, both timing and funding were sufficient for this researcher to conduct an extensive study of project ATHENA.

D. PROBLEM STATEMENT

There are an insufficient number of case studies documenting internal technological innovation efforts within the DOD, and the DOD must harness its intellectual capital to innovate during an era of dwindling defense budgets. Improving innovation from within requires a process, and implementing this innovation process often requires significant organizational change. Case studies documenting the organizational change management challenges faced by DOD units undergoing

innovation initiatives are needed to provide leaders with insights into how to navigate this difficult but essential process.

E. PURPOSE STATEMENT

The purpose of this research is to produce a technological innovation case study for DOD leaders who are interested in fostering innovation within their commands. Creating a culture of innovation is essential to offsetting the drop in external technological innovation resulting from reduced Research and Development budgets. Furthermore, creating innovation-friendly environments harnesses the creative power of the entire organization, which leads to innovations that address more relevant problems. Understanding the skills and processes required to create innovative organizations is necessary for any DOD leader or organization that relies upon innovation to retain a competitive advantage.

F. RESEARCH QUESTIONS

This thesis will chronicle project ATHENA. It will explore how participative design/design thinking can be used to stimulate technological innovation at the tactical level. It will also describe the organizational change management dynamics that come into play when a tactical level unit attempts to innovate via the participative design process. The following two research questions will be addressed within the context of project ATHENA:

1. How can the principles of design thinking be applied at tactical level units (Battalion/Squadron/Ship) to improve technological innovation?
2. How can the principles of organizational change management be applied at tactical level units (Battalion/Squadron/Ship) to improve technological innovation?

G. RESEARCH METHODS

The researcher used a mixture of primary and secondary research to conduct this study. Primary research was conducted through interviews and personal observation. The majority of the primary research was conducted via in-person interviews; however, some interviews were conducted over the telephone. Every effort was made to observe project

ATHENA participants in real time at their place of duty. The researcher made several trips to San Diego to observe and interview project ATHENA participants both preparing for and conducting project ATHENA-related events.

Secondary research was conducted on historical and prevailing theories in the disciplines of participative design/design thinking and in organizational change management. Additionally, the researcher investigated historical accounts posted to project ATHENA websites to augment personal observations of project ATHENA participants.

H. PROPOSED DATA, OBSERVATION AND ANALYSIS METHODS

The researcher utilized a qualitative approach for this case study. The case study framework was preferred because of the large number of factors and variables (many human) involved with project ATHENA. The case study enabled the researcher to expose the major variables and their dynamic interactions, and facilitated capturing lessons and insights that may prove useful to other DOD leaders looking to improve their tactical level technological innovation efforts. Multiple sources were used to triangulate findings and to create a comprehensive view of the entire project.

I. POTENTIAL BENEFITS AND LIMITATIONS

The main benefit of this case study is an enhanced understanding of the principles of design thinking and organizational change management and how they can be used to improve technological innovation at the tactical level. Another benefit of this study is its potential to create awareness and stimulate interest in small unit innovation efforts. Ideally this heightened awareness could lead to an ever-expanding demand within the DOD to create cultures of innovation and creativity, resulting in cost savings and unprecedented technological advancement.

A major limitation of this study is that the researcher picked up the ATHENA story approximately a year after it began. Consequently, the researcher had to rely on secondhand accounts and archival records instead of personal observation to chronicle the project from its inception. Fortunately, the researcher had direct access to all key

ATHENA participants and used extensive personal interviews from multiple sources to clearly outline the first year of the project.

II. LITERATURE REVIEW

A. INTRODUCTION

The literature review has been guided by three major considerations. First, qualitative research methods were deemed most appropriate for this research due to the nature of the topic. Therefore, an understanding of qualitative research methods in general, and case study research in particular, was required in order to conduct this case study.

Second, as the case study progressed it became apparent that organizational change management was a critical element of the project ATHENA story. Therefore, a general review of change management theories was included in this research. This review was needed in order to contextualize the particulars of this case and to better interpret the broader organizational dynamics and cultural changes required for design thinking to be employed successfully in the DOD.

Finally, the focus on innovation at the tactical unit level required an extensive review of design thinking literature in order to inform the landscape of innovation processes. As the research progressed, it became apparent that numerous ideas and processes employed in project ATHENA are espoused by leaders in the nascent field of design thinking.

Taken together, the three disciplines of case study research, organizational change management and design thinking form the prism through which this research was conducted. Additionally, the perspectives of change management and design thinking will be utilized following the research to analyze the case. Ideally, both of these lenses will provide specific insight into project ATHENA, enabling the researcher to deduce generalizable recommendations that will be useful to future DOD organizations seeking to improve tactical level technological innovation.

B. THE CASE STUDY METHOD

1. Introduction

The case study is a type of qualitative research that enables the researcher to chronicle and understand a particular event. Case studies are common in research inquiries like project ATHENA that involve human interactions and dynamics. However, many researchers are hesitant to use a case study methodology because the conclusions and recommendations produced therein are not as generalizable or scientifically “hard” as those produced by quantitative research. This researcher addressed this important point by carefully studying all appropriate research options before initiating an investigation into project ATHENA.

2. Qualitative Research: Background

According to Strauss and Glaser (1999), qualitative research was much maligned by the quantitative community throughout most of the 20th century. The authors contend that rapid technological advancements during that period enabled quantitative research methods to dominate academia, thereby relegating less experimentally-rigorous research methods such as qualitative inquiry to the background. Eventually, the research community viewed qualitative research as a method that could (at best) only uncover broad hypotheses or categorical frameworks that could then be fed into more rigorous quantitative methods for validation and refinement. The authors refute this view of qualitative research and posit that qualitative research is a valid method for understanding complex social phenomenon (Strauss & Glaser, 1999).

John Creswell (2009) further elaborates on the merits of qualitative research in his book *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. He defines qualitative research as: “... a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem” (p. 4). He delineates several types of qualitative research, which include ethnographies, case studies, grounded theory research, phenomenological research and narrative research.

3. Qualitative Methods: Selection

The researcher's objectives and the research environment ultimately determine the best-suited qualitative method. This researcher selected the case study method for exploring project ATHENA because it satisfied several of Creswell's (2009) requirements for a case study, which he states "is a strategy of inquiry in which the researcher explores in depth a program, event, activity, process, or one or more individuals. Cases are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time." (p. 13)

Additionally, this researcher felt that a case study was appropriate because the nature of the research correlated closely with advice Robert Yin (2009) provides in his seminal work on the topic, titled *Case Study Research Design and Methods*. Yin (2009) states that a case study is the preferred qualitative research method when "(a) 'how' or 'why' questions are being posed, (b) the investigator has little control over events, and (c) the focus is on a contemporary phenomenon within a real-life context" (p. 2).

The recommendations provided by Creswell and Yin indicate that a case study is the preferred research method for inquiring into project ATHENA. The research involves an in depth exploration of a contemporary program involving social phenomena. Furthermore, the researcher has no control over these events and seeks to answer "how" questions; namely, how can innovation and design thinking be used within the DOD to improve tactical level technological innovation?

4. The Case Study: Design and Execution

According to Yin (2009), once a researcher has settled upon the case study as the method of inquiry, the researcher should then adhere to the following six-step iterative process to design and execute the research (see Figure 1):

1. Plan: In this phase, the researcher identifies research questions and develops an understanding of the strengths and weaknesses inherent in a case study.

2. Design: In the second step, the researcher defines the unit of analysis, develops a theory and/or propositions, identifies the case study design, and defines quality control procedures.
3. Prepare: Here, the researcher becomes proficient at conducting case studies, develops the case study protocol and secures approval for human subjects research.
4. Collect: In this stage, the researcher adheres to the case study protocol, uses multiple sources of evidence, creates a case study database and maintains a chain of evidence.
5. Analyze: Once the data has been collected, the researcher draws empirically derived conclusions based on examining, categorizing or recombining evidence. The researcher relies on theoretical propositions, determines the appropriate analytic technique and explores rival explanations.
6. Share: In the final stage of the case study, the researcher composes textual and visual materials, displays sufficient information for the reader to reach their own conclusions, and develops a well written document that accurately reflects the phenomenon investigated.

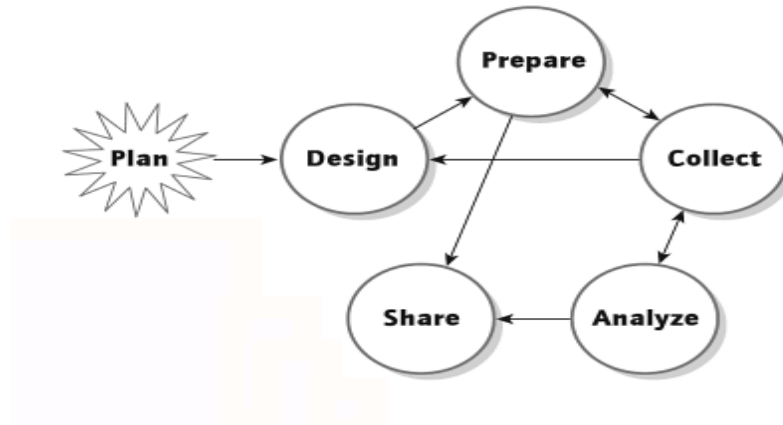


Figure 1. Robert Yin's six-step case study model (from Yin, 2009).

Donna Zucker, in her 2009 article, "How to do Case Study Research," recommends a very similar process for designing and conducting case study research. She expands on Yin's recommendations by focusing on the iterative nature of case study research. She emphasizes the fact that conducting the research and analyzing the evidence occur simultaneously until the research is complete. She advises researchers to

build the following three stages into their research methods and data analysis to avoid a concrete sequential approach that diminishes the quality of the inquiry:

1. Describe the Experience: Here the researcher is concerned with developing questions that allow participants to provide concrete information about their experiences and the meanings they attribute to those experiences. The key is to elicit answers from participants that enable the researcher to identify recurring experiential themes that they can then hone in on in subsequent interviews.

2. Describe the Meaning: In this stage the researcher reviews the literature and develops a framework for ascribing meaning to the experiences solicited in the first stage. The focus here is on distilling the experiences into meaningful interpretations that converge (or diverge) with the existing literature.

3. Focus of the Analysis: When analyzing the evidence, the researcher needs to focus on the major themes described in stage one and further interpreted in stage two. The goal is to provide compelling and clearly defined logical steps demonstrating how the researcher reached conclusions based on the findings in stages one and two. Ideally, these conclusions will be generalizable to other social phenomena; however, the nature of the case study dictates how much applicability the findings and conclusions have outside of the case itself.

5. Case Study Research: Problems and Solutions

Case study research has been plagued by several well-documented pitfalls such as bias, lack of rigor, and a lack of appropriate generalization to broader contexts. (Yin, 2009). This researcher became aware of these issues during the course of the research and while conducting the literature review, and has taken appropriate action to mitigate them.

Yin (2009) indicates that bias is a major concern when conducting case study research because of the researcher's intimate involvement with the participants. While conducting case study research, the researcher frequently interacts with the participants and their environment and conducts in-depth interviews with participants. These activities can lead researchers to become unduly familiar with participants, and this

natural affiliation between researcher and participant can cloud objectivity and eventually lead to researcher bias. To combat this problem, researchers are advised to first become aware of the phenomenon. Second, researchers should seek to obtain evidence from multiple sources (in a process known as triangulation), to ensure that their bias isn't corrupting the evidence (Yin, 2009).

Yin (2009) further indicates that lack of rigor is a frequent problem in case study research. There are multiple reasons for this phenomenon, but most point to researchers failing to develop well planned and designed case study methodologies. To mitigate this risk, Yin (2009) advises researchers to follow well defined design methodologies. He also advises that they use exacting standards and processes when analyzing the evidence and that they provide a clear and logical rationale for developing their conclusions.

Andrew Bennett and Colin Elman highlight the "generalization" problem in their 2007 article, "Qualitative Research: Recent Developments in Case Study Method" by stating that the "problems that confront qualitative methods are indeed difficult, and the consequences of poor case selection and overgeneralization can be more devastating in case studies than in statistical analyses" (p. 473). The authors indicate however, that generalization is applicable in some case study research; particularly, when analysis is coupled with statistical and other formal analysis methodologies.

6. Conclusion

The decision to conduct research into project ATHENA via the case study method involved careful consideration. The case, which involves complex human interactions, lends itself to qualitative research. Furthermore, the fact that the research centers on a current event that the researcher has little control over, and that the research addresses "how" questions, led this researcher to conclude that the case study method was the most appropriate for this inquiry.

C. ORGANIZATIONAL CHANGE MANAGEMENT

1. Introduction

The field of organizational change management emerged over the last century to address the poor success rate of organizational change initiatives. Organizations have always been forced to change in order to keep pace with rapidly evolving markets and shifting environmental conditions. However, this requirement to change has accelerated exponentially in the 21st century as information-age organizations and their environments continue to grow in size and complexity.

A brief summary of the dominant theories within the change management field follows. The reader will first be presented with key foundational change management concepts such as Kurt Lewin's unfreeze-change-refreeze theory of change, David Gleicher's change formula and John Kotter's eight-step change process. Next, the reader will be introduced to more contemporary change management theories that both expand on the foundational theories and in some cases contraindicate them. The goal is to provide the reader with a framework for understanding the change management dynamics at play in project ATHENA.

2. Historical Change Management Theories/Concepts

The following theories provide an initial framework for understanding organizational change management.

a. Unfreeze-Change-Refreeze

A three-step change process first introduced by social psychologist Kurt Lewin in the early 20th century has become a foundational theory in the field of organizational change management (see Figure 2). Lewin developed the theory to better understand planned change efforts, and his model of unfreeze-change-refreeze has influenced many key theorists in the field. One theorist who built substantially on Lewin's original theory was Edgar Schein. Schein spent the latter half of the century applying and refining Lewin's original process and in 1995 provided his interpretation of the classic three-step

model in an article titled, “Kurt Lewin’s Change Theory in the Field and in the Classroom: Notes Toward a Model of Managed Learning.”

Schein (1995) felt that in order to understand change, people had to realize that “human change, whether at the individual or group level, was a profound psychological dynamic process that involved painful unlearning ... and difficult relearning as one cognitively attempted to restructure one’s thoughts” (p. 2). Thus, simply appealing to someone’s intellect by providing them with logical explanations for the change was, while helpful, insufficient for a change to stick. The person or group targeted for the change had to first feel dissatisfied with their current condition; after all, if the status quo was sufficient then why change? (Schein, 1995).

The concept of status quo was important to the theory. Schein (1995) believed that driving and restraining forces were at work in most organizations, and that eventually the tension between the two forces would settle into a status quo that he termed a “quasi-stable equilibrium.” Thus, any change effort would upset this equilibrium and set off restraining (or driving) forces that would seek to counteract the change. Thus, the dynamics operating within the organization produced a “force field” that naturally resisted change (Schein, 1995).

Schein believed that the best way to offset this force field dynamic was to “unfreeze” people’s perspective in a three-stage process. First, people had to become dissatisfied with their current condition. They had to feel frustrated or disappointed that evidence disconfirmed their belief that the status quo was acceptable. Second, people had to face the threat presented by the challenge to the status quo. Finally, conditions within the organization had to be such that employees felt psychologically safe enough to overcome their fears—they had to feel comfortable confronting the daunting task of giving up previously held behaviors and norms. Schein (1995) sums up the process by stating, “The key to effective change management, then, becomes the ability to balance the amount of threat produced by disconfirming data with enough psychological safety to allow the change target to accept the information...and become motivated to change” (p. 5).

Schein (1995) felt that the target change audience was ready for change once the unfreezing process was complete. However, introducing the change was a delicate affair that required people to undergo what he termed “cognitive restructuring.” During this process, change targets acquire new information either through interaction with role models or through interacting with their environment. This new information in turn changes their understanding, alters their beliefs and judgments or expands their cognitive horizons (Schein, 1995). Collectively, these sub-processes serve to introduce the change to the target audience; however, considerable effort must be expended to ensure that the changes stick.

Schein (1995) termed the process by which the changes become the new status quo “refreezing.” He felt that the changes had to foster behaviors and norms that were congruent with those of the target audience in order to become adopted. If they were too different, then the change would cause further disequilibrium, which would trigger the entire unfreeze-change-refreeze process over again (Schein, 1995).



Figure 2. Kurt Lewin's change model (from https://www.digitalmethods.net/MoM/CaseStudy#_ftn5).

b. The Change Formula

Another simple yet foundational concept in the field of organizational change management is David Gleicher's change formula. First proposed by Gleicher in the 1960s, the formula was simplified by Kathleen Dannemiller and Robert Jacobs in the

1980s. In 1992 the two explained their slightly modified change equation in the article, “Changing the Way Organizations Change: A Revolution of Common Sense.” Their change equation is:

$$D \times V \times F > R$$

D represents ‘d’issatisfaction or frustration with the current situation (i.e., status quo). V represents a ‘v’ision of a future state or an alternate (and better) reality. F represents the ‘f’irst steps taken to reach that future state. Finally, R represents the ‘r’esistance to change.

The equation posits that in order for a change effort to be successful, the product of the dissatisfaction, the vision and the first steps taken must be greater than the overall resistance to the change. It is important to note that the factors are multiplied in this equation. This means that if any one of the three factors on the left side of the equation is zero, the product of all three will be zero. If this is the case then the factors driving the change (left side) will be less than the resistance to change (right side) and the change effort will fail (Dannemiller & Jacobs, 1992). While the change equation doesn’t guarantee success (or failure) in a given change scenario, it does provide managers with a useful diagnostic tool that can be used prior to commencing large scale organizational change initiatives.

The change equation posited by Dannemiller and Jacobs (1992) has many similar characteristics to Schein’s (1995) change process. First, the change equation itself is a fairly robust mathematical model of Schein’s force field. D, V and F represent the drivers at work in the organization, and R represents the resistance that is always present in the organization. Thus, if no change is being introduced, the left and right side of the equation are in “quasi-stable equilibrium” which would be represented by an “=” instead of a “>.” And, when change is introduced, the system goes into a state of disequilibrium which would be represented in the formula by a “>” instead of an “=.” The change formula therefore depicts mathematically the relationships between the driving and resisting forces in an organization, and demonstrates how these factors are in constant tension as they oscillate between states of equilibrium and disequilibrium.

Second, the variables within Dannemiller and Jacobs' (1992) change formula share many similarities with Schein's three-step change process. The 'D' in the change formula (dissatisfaction with the status quo) maps directly to Schein's "unfreezing" process; in particular, the disconfirmation stage that occurs when change targets become dissatisfied with the status quo. The 'V' maps closely to Schein's second step since the vision of the future represents the ideas and concepts that change targets acquire during the "change" stage. The 'F' doesn't have a direct corollary in Schein's model, but it can be inferred that the first steps taken by the organization would include those that ensure the newly introduced behaviors are congruent with the norms and behaviors already espoused by the organization and its employees.

c. The Eight-Step Change Process

John Kotter was well versed in the change formula and the three-step process when he wrote his classic book on change management in 1996 titled *Leading Change*. Kotter spent many years investigating large-scale change efforts and identified the following eight common errors that plagued failed change initiatives: allowing too much complacency, failing to create a sufficiently powerful guiding coalition, underestimating the power of vision, under-communicating that vision, permitting obstacles to block the new vision, failing to create short-term wins, declaring victory prematurely and neglecting to anchor changes firmly in the corporate culture (Kotter, 2012).

In *Leading Change* (2012), Kotter focused on the two recurring themes that he had observed in successful change initiatives: an effective change process and superior leadership guiding that process. He combined these elements into a now legendary model that addressed the common mistakes he felt contributed most to failed change programs. Kotter felt that organizations could greatly improve their odds of implementing successful change initiatives if they followed these eight steps in succession (see Figure 3):

1. Establish a Sense of Urgency: The goal here is to make employees become dissatisfied with the status quo, and to help them see the need for change. Examining the competition, and dealing with crisis (even manufacturing crises) are methods used in this stage to increase employee dissatisfaction.

2. Create a Guiding Coalition: The complexity of the modern corporation makes it nearly impossible for one person to implement lasting change. Therefore, the leader should focus on assembling a team of highly influential people who work well together, believe in the change and have the power to lead the change.
3. Develop a Vision and Strategy: In this stage, the leader focuses on the tandem goals of creating a compelling vision that galvanizes and inspires employees and developing a grand strategy for implementing that vision. Vision without strategy — and vice versa — will lead to failure.
4. Communicate the Change Vision: The main objective in this step is to walk-the-walk and talk-the-talk. Leaders focus on modeling the new behaviors, and push the vision and strategy out to all employees, thereby ensuring that they clearly understand the changes and have a chance to discuss them.
5. Empower Broad-Based Action: The goal here is to empower employees to take action by creating an organizational structure and culture that subverts obstacles and encourages risk taking.
6. Generate Short-Term Wins: Change efforts frequently stall if successes are few and far between. So, leadership plans for small victories and visibly celebrates them in order to keep employee morale and motivation high.
7. Consolidate Gains and Produce More Change: Here, leadership capitalizes on the momentum generated by recent successes to increase the scope and intensity of the change effort.
8. Anchor New Approaches in the Culture: In the final stage, leadership focuses on making the changes stick by clearly demonstrating the way in which the changes led to improvements. Furthermore, changes are made 'stickier' by ensuring that the new behaviors and norms are in line with organizational culture and practices (Kotter, 2012).



Figure 3. John Kotter's eight-step change model (from <http://www.psma.com.au/?publication=2012-nay-gsdi13-paper>).

The eight-step change process advocated by Kotter shares many similarities with Schein's three-step change model. Figure 3 shows that the first four steps of Kotter's process map almost exactly to Schein's 'unfreeze' stage. In fact, Kotter even uses similar terminology when describing these steps: "The first four steps in the transformation process help *defrost* a hardened status quo" (Kotter, 2012, p. 24). Next, stages five and six in Kotter's model map closely to Schein's 'change' stage. In both models, the new ideas are introduced and the change targets begin to assimilate them. Finally, stages seven and eight in Kotter's model fit closely with Schein's final 'refreeze' stage. Again, Kotter uses terminology similar to Schein's when describing the last step: "The last stage *anchors* the changes in the corporate culture and helps make them stick" (Kotter, 2012, p. 24).

Kotter's eight-step process also shares many similarities with Dannemiller and Jacobs' change formula. Step one in Kotter's model, which deals with establishing a sense of urgency through increasing employee dissatisfaction, closely correlates to the Dissatisfaction variable ('D') in the change formula. The Vision variable ('V') is addressed in steps three (develop a vision and strategy) and four (communicate the change vision) in Kotter's model. The First Steps variable ('F') is less tightly coupled to Kotter's process, but step two and steps five through eight in Kotter's model could be

viewed as steps that an organization would need to take to ensure the change effort succeeded. Finally, the Resistance variable ('R') is represented by all of the factors Kotter identifies in his model that seek to resist change: cultural norms, human foibles, institutional inertia, etc. (Kotter, 2012).

3. Contemporary Change Management Theories/Concepts

The following theories build upon traditional theories and provide additional frameworks for understanding organizational change management.

a. Pace, Sequence and Linearity

As the Information Age dawned, organizational change management researchers observed phenomena that often seemed to refute the classical theories. Many of these bedrock theories seemed archaic when applied to the incredibly complex organizations operating in the highly interconnected world of the 21st century. Fresh perspectives were needed, and a new generation of organizational change researchers provided compelling new ideas that advanced the field.

In 2004, researchers John Amis, Trevor Slack and C. R. Hinings investigated the role that pace, sequence and linearity of change played in large-scale organizational transformations. The study followed 36 Canadian Olympic National Sport Organizations (NSOs) during a period in which the NSOs were forced to change from minimally managed volunteer organizations to professionally staffed, centrally managed bureaucracies.

Only eight NSOs succeeded in making the changes during the 12-year transformation period; the remaining 28 NSOs failed to do so. Thus, the researchers focused their inquiry on the differences between the two groups in three critical areas: the speed at which change was implemented (pace), the areas within the organization where change was implemented (sequence) and how the changes were assimilated by the organization (linearity) (Amis, Slack & Hinings, 2004).

1. Pace: Change can be implemented on a scale ranging from fast to slow. Traditional change theory suggests that quickly implemented changes are more successful than those implemented slowly. The findings from this

study refute that notion. The researchers found that while the successful NSOs did implement their changes quickly, the changes gradually tapered to a slower pace for the remainder of the transformation period. The researchers felt that this combination of a quick-change period followed by a slower absorption phase helped the changes stick.

2. Sequence: Change can be targeted at the core of an organization first and then expanded out to the periphery—or vice versa. Traditional change theory suggests that changes targeting high impact business functions first are more successful, and the findings from this study support that view.
3. Linearity: Organizational change can occur smoothly (linearly) or it can happen via fits and starts (non-linearly). Traditional change theory indicates that successful change is smoothly absorbed into the organization in a linear manner. The findings from this research disprove that view. Successful NSOs tended to introduce and absorb the changes in a non-linear manner. The researchers suggest that introducing contentious changes and then retracting them for a time and then reintroducing them was a key to successful change adoption.
4. These findings refuted many traditional conceptions of the change process, and illuminated two critical areas that managers should focus on while implementing change. First, go fast; and then, slow down. Second, focus change efforts within core business areas first and then let the changes permeate throughout the rest of the organization (Amis et al., 2004).

b. Small Steps Leading to Radical Changes

In 2007, Donde Plowman and a team of researchers investigated how small changes can lead to unintended and radical organizational change. Traditional change theory indicates that radical change occurs as a result of planning, and that it happens in an abrupt manner following a long period of equilibrium. However, Plowman et al. found evidence to the contrary, and published their findings in a seminal article titled, “Radical Change Accidentally: The Emergence and Amplification of Small Change.”

Plowman’s team focused their research on a church that had undergone an enormous transformation as a result of an inauspicious decision to start serving homeless people in the neighborhood hot breakfast on Sunday mornings. The hot breakfast concept caught on, and over the course of several years the program grew exponentially and expanded to include medical and dental services. Eventually, hundreds of homeless people began participating in the program and even joined the church body. This caused

significant issues in both the church and the surrounding neighborhoods and preempted radical transformational change within both communities (Plowman et al., 2007).

The researchers analyzed the data through the lens of complexity theory and identified the following two key findings that contradicted traditional change theories (Plowman et al., 2007):

1. Radical change does not have to occur abruptly as traditional change theory posits; rather, it can occur continuously over long periods of time. This corroborates the findings of Amis, Slack and Hinings (2004) who noted the same phenomenon in their research on Canadian NSOs.
2. The leader should focus on interpreting as well as directing. Traditional change theory promotes the image of the leader as the sole visionary who creates and drives the change effort. However, the leaders in this study acted as “sense givers” who interpreted the situation and gave meaning to the numerous small changes that permeated the environment. This enabled those small changes to take hold within the organization and to morph into larger more radical changes.

c. Change from Within

Trish Reay, Karen Golden-Biddle and Kathy Germann offered a new perspective on the effect embeddedness has on change in their 2006 article titled, “Legitimizing a New Role: Small Wins and Microprocesses of Change.”

The researchers conducted a four-year inquiry into a transformational change effort undertaken by Canadian health care facilities that attempted to introduce a new job position into a firmly established positional hierarchy. Traditional change theory indicates that external factors are key drivers of successful change. External factors such as new ideas, environments or leaders can be introduced from outside the organization but, as Reay et al. found, they can also be introduced from within. However, if the ideas or leaders come from within they must act as if they were “disembedded” from the organization. Thus, they must behave in ways that differ from the norm—essentially behaving as if they were an external factor (Reay, Golden-Biddle, & Germann, 2006). The researchers discovered that embeddedness actually contributed to successful change—rather than detracted from it, as traditional change theory suggests. They

identified three ways (or microprocesses) by which actors utilized their embeddedness to implement the change (Reay et al., 2006):

1. Cultivating Opportunities for Change: Actors in the new job position actively monitored the environment for opportunities to increase their visibility. Their activities acted like a PR campaign that served to increase awareness of the new job position.
2. Fitting the New Role into the Prevailing System: Actors in the new job position designed their position such that it utilized critical resources and became a part of key organizational structures. Thus, the actors ensured that their jobs quickly gained positional power within the organization.
3. Proving the Value of the New Job: Actors in the new job used their inherent understanding of the health care system to demonstrate the value the new position created for the organization.

The researchers also identified a fourth dynamic that the new actors utilized and which transcended the three microprocesses listed above. The actors diligently devised opportunities for small wins and were quick to visibly celebrate these wins when they occurred. This served to build momentum for the change initiative and helped dissuade resistors (Reay et al., 2006).

The three microprocesses identified in this research refuted conventional change management wisdom. However, the use of small wins to create momentum confirmed classical change management theory by supporting step six of Kotter's change model: Create Small Wins.

4. Conclusion

Pioneering work by Kurt Lewin, Edgar Schein, and John Kotter established the foundations of organizational change management in the 20th century. Contemporary work by Amis et al., Plowman et al., and Reay et al., advanced these concepts and made them more relevant within the context of the 21st century. The need for organizational change continues to grow as technology improves and global enterprises become increasingly interconnected. However, organizations will also need to become adept at another key business function if they are to survive in this rapidly shifting landscape: they will need to innovate.

D. DESIGN THINKING

1. Introduction

Design and the design thinking mindset have always been critical elements of innovation. While the terms design and design thinking are similar, they differ in that, “Design thinking is generally referred to as applying a designer’s sensibility and methods to problem solving ... It is not a substitute for professional design or the art and craft of designing” (Lockwood, 2009, p. xi). Thus, design thinking is more of a viewpoint or ethos, while design implies a specific discipline such as interior design or industrial design.

2. The Evolution of Design Thinking

The following theories provide an initial framework for understanding design thinking.

a. Industrialism versus Individualism

The focus of design has always been to make things such as products, services or processes better. However, as Sohrab Vossoughi illustrates in *Rotman on Design* (Martin & Christensen, 2013), the way in which design and design thinking were used to fuel innovation in corporate America has changed significantly over the years.

During the Industrial Age (approximately 1700–1950) designers used improvements in technology to mass produce products at faster rates. Vossoughi calls this period the Age of Representation, and states that the purpose of manufacturing during this era was primarily to *satisfy people’s needs*. Even greater improvements in manufacturing technology ushered in a new era, the Age of Simulation, following World War II. From 1950 to 1980, the focus of business manufacturing shifted to *satisfying people’s desires*. Design thinking was employed during this period to help businesses become more efficient at mass producing an ever-increasing variety of products. Finally, as the Information Age began in the late 1980s, the locus of power in the business world shifted from the corporations to the consumer. This marked the advent of the Age of

Meaning where businesses currently use design thinking to address consumer demands for higher quality and authenticity (Martin & Christensen, 2013).

Craig Vogel traces the beginning of the design thinking revolution to the late nineteenth century. In his article, “Notes of the Evolution of Design Thinking: A Work in Progress” (Lockwood, 2009), Vogel states that the mass production culture of the late Industrial Revolution created a backlash among designers who felt that the dehumanizing effects of assembly line manufacturing were no longer acceptable. These individuals pioneered the Arts and Crafts movement, which was “... a reaction against the process of industrial production, emphasizing the quality of the product and experience created for consumers” (Lockwood, 2009, p. 4).

Thus, the Arts and Crafts movement served as a human-centered counterpoint to the scientific manufacturing processes that dominated the early 20th century. These opposing views of consumerism still exist today. The industrial behemoths employ statistical control measures and analytical rigor to mass produce an enormous amount and variety of goods at cheap prices, while the Arts and Crafts revivalists employ people-centric design thinking to produce products that are both functionally satisfying and aesthetically pleasing (Lockwood, 2019).

b. Design Thinking and Business Management

These differing views of industrial design and production significantly impacted the nascent field of business management, which emerged in the middle of the nineteenth century. As Richard Bolan and Fred Collopy illustrate in their 2004 book *Managing as Designing*, those who advocated the scientifically-based, mass production model of manufacturing favored a managerial approach that centered on decision making. The manager was viewed as decision maker who used education and experience to choose the optimal solution from a set of available options by carefully analyzing the pros and cons, financial impacts, and risk associated with each option.

Those who advocated the human-centered, limited production model of manufacturing on the other hand favored a managerial approach that viewed the manager as a designer. The manager was viewed as a creator who employed a design thinking attitude to identify the best possible solution rather than to simply choose from the

existing options. Thus, the goal of the manager was to frame the problem in such a way that the best possible solution would consistently emerge (Boland & Collopy, 2004).

3. Design Thinking Theorists and Design Thinking Business Applications

The following individuals expanded the institutional understanding of design thinking, and their perspectives form the bedrock of contemporary design thinking theory.

a. Herbert Simon

The concept of problem framing was first identified in the late 20th century by design thinking pioneer and Nobel Laureate, Herbert Simon. Simon believed that the solution to a problem begins with how the problem is framed. Simon also posited that humans problem-solve by reducing the field of potential solutions into a well-defined problem space. The flaw with this tactic is that the problem space is limited, which implies that the solutions contained in the problem space are also limited. Thus, the problem-solving approach used by most humans is inadequate since the best solutions are often missed because the problem has not been properly framed (Boland & Collopy, 2004).

Simon went on to advocate that the best solution for this pitfall in human decision-making was to use a design thinking mindset to look at how things *might be* instead of how they *are*. Thus, the manager's goal was "... not to discover the laws of the universe, but to act responsibly in the world to transform existing situations into more preferred ones" (Boland & Collopy, 2004, p. 8). Thus, by focusing on how the problem is represented, a design thinking manager can open up the problem space and improve the likelihood of discovering an optimal solution.

b. Roger Martin

In 2009, Roger Martin expanded on Herbert Simon's design thinking ideas in a book titled *The Design of Business: Why Design Thinking is the Next Competitive Advantage*. Martin's central purpose in writing the book was to offer leaders a way to

reconcile the seemingly incompatible approaches to manufacturing outlined by Boland and Collopy.

Martin explains that the scientific and analytically driven approach to mass industrial manufacturing has allowed organizations to grow in size and influence by enabling them to produce the same goods as their competitors — but more efficiently. He terms this approach to business “exploitation of routines,” and shows how companies can effectively scale up and improve their efficiency by employing this business model. However, these benefits come at a cost. As organizations increasingly rely on analytical thinking and deductive logic to scientifically improve their work processes, they begin to lose their edge in creativity and ingenuity. Martin posits that companies that are overly focused on exploiting current routines tend to become less innovative over time, which makes them vulnerable to leaner, faster and more innovative companies (Martin, 2009).

These smaller and more creative companies utilize intuition and inductive logic to innovate new and compelling products that will supplant the status quo. These companies pursue an “exploration of alternatives” business model, which excels at discovery and innovation. However, the model’s weakness is that it doesn’t enable organizations to scale up and efficiently mass produce their innovative products (Martin, 2009).

Thus, the current business landscape is populated by companies that are either good at innovating (doing the right thing) or excel in getting innovations to the consumer (doing things right). Martin suggests that companies wishing to develop a competitive advantage should focus on becoming good at both types of business functions. By becoming more adept at gaining insights through what he terms the knowledge funnel, Martin outlines a way in which companies can both improve efficiency (through an exploitation of routines) and improve innovation (through an exploration of alternatives) (Martin, 2009).

Martin’s knowledge funnel is composed of three stages (see Figure 4). Stage one is ‘exploration of a mystery.’ In this stage, investigators seek to understand a mystery that Martin (2009, p. 9) describes as, “Things in our environment that excite our curiosity but elude our understanding.” The goal is to develop an understanding of the situation, to

explore hidden meanings and to try and find patterns or relationships that will help the investigator develop a more refined picture of the problem. As an example, Martin uses the concept of gravity, which initially began with scientists observing a mystery (items falling to the ground).

Once an investigator gains a rudimentary understanding of the problem, they then proceed to stage two of the knowledge funnel: develop a heuristic. Martin (2009) describes a heuristic as a rule of thumb that reduces the field of potential solutions and allows researchers to focus on a simplified representation of the problem. In the gravity example, the heuristic was the formulation of a basic understanding of gravity as a concept (items fall to the ground at the same speed regardless of their weight).

As researchers continue to develop and refine their heuristics they may discover a repeating pattern or chain of causality that enables them to solve the problem. Ideally, the phenomenon will be distilled into a repeatable logic or even a mathematical formula that fully describes it. Knowledge of a problem whose solution can be reduced to a step-by-step procedure is in the final stage of the knowledge funnel: the algorithm. An algorithm is a detailed explanation of how to solve the problem and in its most advanced state would be represented by computer code (Martin, 2009). The algorithm stage of the gravity example was attained when scientists developed a quantitative explanation (formula) of gravity.

Martin suggests that companies should use design thinking to generate ideas that can then be moved up (and down) the knowledge funnel in a recursive manner. Ideally, these companies will excel at intuiting ideas (exploring alternatives) and then moving them through the knowledge funnel until they are converted into a heuristic that is readily manufactured (exploitation of routines). Companies that can synthesize these two business approaches will transform into highly competitive 21st century companies that focus on the ‘design of business,’ instead of the ‘business of design’ (Martin, 2009).

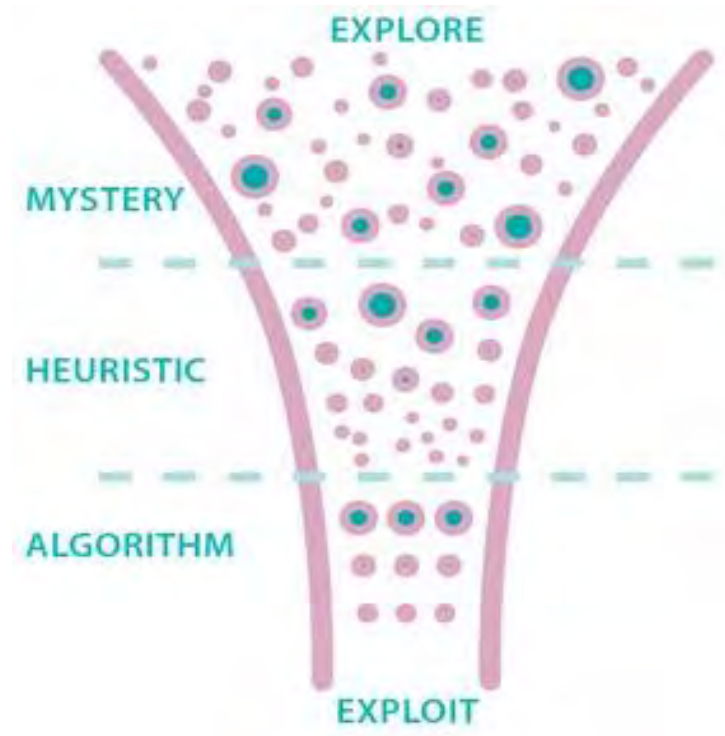


Figure 4. Roger Martin's knowledge funnel (from Martin, 2009)

c. Tim Brown

Tim Brown, the CEO of internationally acclaimed design firm IDEO, shares Martin's belief that design thinking offers companies unique advantages in the modern business world. In his book *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* (2009), Brown outlines design thinking methodologies that companies can use to increase creativity and improve innovation.

Brown feels that design thinking should “match human needs with available technical resources within the practical constraints of business” (Brown, 2009, p. 4).

He recommends that design thinkers should envision innovation as a process with three overlapping spaces: inspiration, ideation and implementation (see Figure 5). Inspiration is the problem itself, which (using Simon's insights) are framed as an opportunity. Ideation is the process through which ideas and possible solutions are developed, tested, refined and updated. Finally, implementation is the process that converts the winning idea into reality (Brown, 2009).

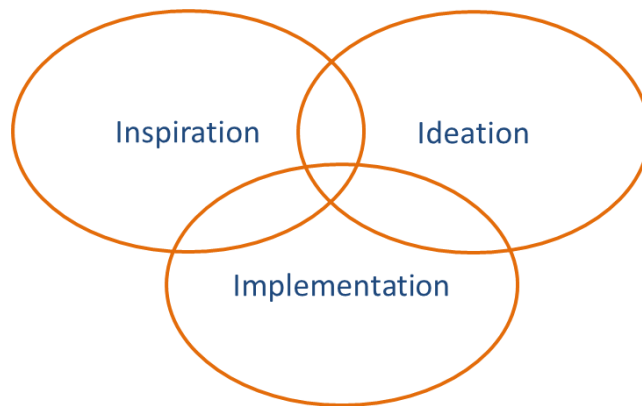


Figure 5. The three spaces of innovation (from Brown, 2009)

Brown outlines five specific actions and requirements that a company seeking to navigate these innovation spaces will require. The first is to find people with the requisite skills to operate in interdisciplinary teams. Teamwork is critical to design thinking, and while technical experts are a must for any team, Brown has found that people who couple in-depth technical knowledge in one area with general skills and interests in a variety of other disciplines make the most effective team members. These individuals who excel in both depth and breadth and are classified as “T” people—they possess skills and knowledge vertically, but have the inclination and skills to collaborate across disciplines (cross the “T”) (Brown, 2009).

The second requirement a company must meet in order to operate in innovation spaces is the ability to develop cultures of innovation. Creativity is stifled in rigid bureaucracies driven by efficiency and risk aversion: companies employing an ‘exploitation of routines’ business model don’t emphasize innovation. Conversely, creativity flourishes when an organization tolerates mistakes, rewards risk-taking and allows employees the flexibility to develop ideas and to continuously experiment. These organizations employ an ‘exploration of alternatives’ business model and they tend to be structured more flatly and embrace ‘play’ as a part of everyday employee activity. These actions serve to create a more forgiving and fun environment that employees need in order to truly explore their creative capacities (Brown, 2009).

A third factor present in successful innovation via design thinking is the strategy of “help[ing] people articulate the latent needs they may not even know they have” (Brown, 2009, p. 40). Thus, a critical goal in design thinking is to understand the customer’s true requirements, not simply to assume that the customer wants the product you’ve designed. Identifying customer requirements happens through insight, which is gained via extensive observation of the customer, and through empathy. Design thinkers use empathy — the ability to see, experience and feel the world as their customer does— to develop an understanding of the customer’s true needs (Brown, 2009).

Once a customer’s true needs are known, the innovation team can then use convergent and divergent thinking to identify potential solutions. This mental approach to problem solving is the fourth factor in Brown’s design thinking tool kit (see Figure 6). During the divergent phase of the innovation process, the team uses brainstorming to identify numerous ideas and potential solutions. Then, during the convergent phase, the team switches to a decision mindset and converges on a smaller set of solutions. This process is then repeated recursively until the best solution emerges (Brown, 2009).

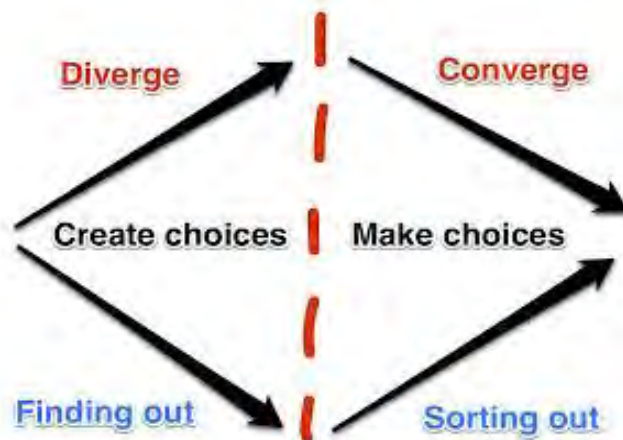


Figure 6. Design thinking mental states: Diverge and Converge (from Brown, 2009)

The final two ingredients in Brown’s recipe for successful innovation via design thinking are experimentation and prototyping. Teams require time and resources to

explore alternatives and develop cutting edge innovations, and one essential way of identifying potential solutions via experimentation is prototyping. Brown describes prototyping as a way of quickly identifying an idea's feasibility through the use of models, sketches or any artifact that accurately represents the idea's purpose and functionality. Furthermore, Brown explains that teams should prototype often and early in the innovation process in order to quickly identify viable solutions. This rapid prototyping approach streamlines efforts by identifying ideas that won't work, which saves valuable resources and enables the team to concentrate their efforts on only feasible options (Brown, 2009).

Brown urges companies to utilize these five design thinking strategies when navigating the three innovation spaces of inspiration, ideation and implementation. He feels that this method of problem solving offers companies seeking innovation an alternative to the 'exploitation of routines' business model that often leads to stagnation and demise. However, Brown also warns companies that an overreliance on design thinking to solve all of its problems is unwise, because while design thinking excels at enabling innovation, it is unnecessary for activities that require exact replication: in these cases, the tried and true methods of an 'exploitation of routines' mentality are sufficient (Brown, 2009).

4. Conclusion

Design thinking pioneers such as Herbert Simon helped companies visualize different approaches to innovating — they could either focus on scientific methods to create generic products for a mass market, or they could use human-centered approaches to design elegant solutions that were both functional and aesthetically pleasing. Modern design thinking practitioners such as Roger Martin and Tim Brown expanded on these foundational design thinking concepts by developing business applications that companies currently use to drive innovation.

E. LITERATURE REVIEW CONCLUSION

The fields of organizational change management and design thinking provide leaders with tools to help them identify necessary changes (design thinking) and with

ways of actually implementing those changes into their organizations (change management).

The need to innovate within the DOD has never been greater. DOD leaders can utilize the tenets of design thinking to harness the creative potential of their personnel and to facilitate converting their ideas into technological innovation. Furthermore, DOD leaders can apply techniques developed in the organization change management discipline to implement the cultural changes necessary in transitioning from a 20th century ‘exploitation of routines’ mentality to a 21st century ‘exploration of alternatives’ mindset.

THIS PAGE LEFT INTENTIONALLY BLANK

III. CASE STUDY

A. CDR LEBRON

It was October of 2012, and commander (CDR) Richard LeBron looked up from his briefing notes at the group of young officers assembled in the wardroom of the *USS Benfold* (DDG 65). He had assumed command of the Guided Missile Destroyer and her crew of approximately 300 Sailors just minutes prior, and his first act as commanding officer (CO) was to provide his officers with his vision and command philosophy.

As the executive officer (XO) of the *USS Benfold* for the previous 18 months, CDR LeBron had plenty of time to imagine and refine this vision, and as he delivered his meticulously crafted opening pitch he painted a picture of a crew of innovative professionals running a top notch ship that would strive to be “100% ready 100% of the time.” Additionally, he wanted his junior officers (JOs) to pursue “simplicity in thought, simplicity in communications and simplicity in execution,” and he stressed that his primary concern was to “empower sailors; to get them to question, to think, and to express their ideas” (CDR LeBron, interview, June 17, 2014). After the brief meeting, the officers stood smartly at attention and prepared themselves for a journey with their new CO that would unfold in a way none of them expected.

This journey had little to do with the content of the speech, for CDR LeBron’s sentiments echo those of hundreds of COs when they assume command. What differed was the context: the timing, personalities, culture, command climate, environmental factors and myriad other intangibles that interacted over the following 18 months to create one of the most innovative ships in the Navy.

As with all commands, it starts with the commander. They set the tone, and from day one CDR LeBron emphasized intellectual curiosity. His experiences as an enlisted Sailor, his Master in Business Administration (MBA) from Florida State, and his immersion in the highest levels of the DOD as a speechwriter for the Chief of Naval Operations (CNO) and then the Chairman of the Joint Chiefs of Staff, gave him a unique

multi-echelon perspective on creative thinking and innovation in the Navy. CDR Lebron recalls how those experiences shaped his command philosophy:

The goal is to educate our officers to think beyond the tactical, because I don't think we do a very good job of that. Me being a product of 24 years of being an officer and an enlisted Sailor, I can tell you, at least in my own personal experience, that there was absolutely zero investment made in me as a junior officer to think beyond doctrine and go put ordnance on target. And that's great, but, we train the senior officers in the United States Navy to think strategically when we need to start training those guys when they're Ensigns and start having them think at the strategic level. We don't do that. (CDR Lebron, interview, June 17, 2014)

This concern for expanding the mental horizons and creative abilities of JOs has been a pervading theme throughout CDR LeBron's career. In 2006, he published an essay through the Naval Institute outlining the need for the Navy to adopt an entrepreneurial approach to problem solving. In the article he recommended that the Navy foster this entrepreneurial perspective by creating an entrepreneurial officer corps that would operate in, "... a professionally safe environment where entrepreneurial opportunity development teams can pursue new opportunities without fear of the consequences of failure" (CDR LeBron, 2006 p. 2).

During the six-year gap between publishing the article and taking command of *USS Benfold*, CDR Lebron researched innovation efforts both inside and outside of the military and began to formulate his vision for getting Sailors to think more entrepreneurially. His MBA experiences and insatiable appetite for books by popular innovators like Steve Jobs helped him envision a day when he led a ship where:

The goal was to open the JOs' eyes to being willing to look at things beyond that which is doctrinally defined. We have a lot of that and it's been a big dissatisfaction of mine since I was an Ensign that we're taught to follow the rules, regulations, procedures. And that's all fine and dandy. But, in the process of doing that, we lose myriad opportunities to encourage people to have a little bit of independent thinking and to question the status quo and to ask, well, why do we do it that way? Or why don't we do it this other way? Or why don't we explore these other possibilities? (CDR LeBron, interview, June 17, 2014)

Thus, by the time CDR LeBron took command of the *USS Benfold*, he knew that he wanted a cadre of young officers who were mentally agile and innovative. He also knew that he couldn't create them on his own; that they weren't simply going to shed years of Navy doctrine and procedural compliance and materialize aboard *Benfold* by his second day of command. If the changes he'd envisioned were to become reality, the officers assembled in the wardroom listening to his opening speech would be *the* key to success—they would be both the enablers of his vision and the target audience for that vision.

As he concluded his remarks CDR LeBron wondered, with that curious mix of trepidation and excitement known to those embarking on bold journeys, how this new approach to innovation and creativity would be received. He also wondered how his team was going to take his vision and turn it into reality: who would champion the cause?

B. LT NOBLES

Among the officers listening to CDR LeBron's speech that day was the Weapons Officer, Lieutenant (LT) David Nobles. LT Nobles was one of the more senior officers onboard *Benfold* and was well respected for his engaging personal style and creative mindset. He studied journalism in college and had earned his MBA while leading the Naval Reserve Officer Training Corps at Pennsylvania State University. While earning his MBA, LT Nobles recalls:

When I was up at Penn State taking the courses, the concepts that always sort of inspired me the most were the innovation and organizational development courses. And Dan Pink stuff ... motivation ... that kind of thing. So while I was studying all this stuff I thought why don't we do anything like that in the Navy? So I thought, at some point while I'm there, on my next tour, I'm going to try to do something. Otherwise, if we're not trying to get better, what are we doing? (LT Nobles, interview, May 30, 2014)

LT Nobles was assigned to *Benfold* following his Penn State tour in April 2012, and served with CDR LeBron (while CDR LeBron was XO) for approximately six months before he became the CO. He knew that CDR LeBron was adamant about fostering intellectual exploration and innovation and had seen a glimpse of that attitude

pervading the wardroom while CDR LeBron was still the XO. The *Benfold* had deployed to the Persian Gulf in June 2012, and while on deployment, the wardroom started a book club, and was in the habit (at the XO's behest) of augmenting routine briefs with stimulating intellectual tidbits. In addition, the crew had started an educational initiative called *Benfold* University in which any crew member with subject matter expertise could hold classes and instruct other interested crew members. Throughout the deployment, classes were taught on a variety of topics ranging from welding to foreign languages and calculus (LT Nobles, interview, May 30, 2014).

Thus, LT Nobles was not surprised to hear CDR LeBron's command philosophy and vision, and had already been ruminating on ways to get the *Benfold* officers to think more creatively. One night shortly after CDR LeBron took command, LT Nobles ran across a TED talk by Dan Pink that outlined the ways companies, most notably an Australian firm called Atlassian, increase employee motivation by giving them time off to cultivate creative ideas. LT Nobles was passionate about the topic of motivation and recalls his idea for encouraging JOs to innovate aboard the *Benfold*:

So I listen to that Ted talk and read Pink's stuff and read Gladwell and all those guys and I started thinking about how we could do something like that with the wardroom. At least, the wardroom as a sort of test bed. Give the wardroom a day off to think of an idea to make the Navy or *Benfold* or the San Diego waterfront better, and then have each person/team give a casual five-minute presentation of their idea. (LT Nobles, interview, May 30, 2014)

Over the coming weeks, LT Nobles refined his idea, which he termed "wiki wardroom," and eventually pitched the idea to CDR LeBron.

C. THE "WIKI WARDROO" PITCH

Sometime shortly after CDR LeBron took command, LT Nobles approached him with his "wiki wardroom" idea. LT Nobles recalls the meeting:

I wanted to give the wardroom a day off to come up with ideas kind of like Atlassian did. And the CO kind of looks at me with that 'explain yourself Lieutenant' sort of look. And we kind of talked through it a little more, and I showed him the TED talk with Dan Pink's stuff, and he said

something to the effect of, ‘yeah, sure, let’s try it.’ ” (LT Nobles, interview, May 30, 2014)

For CDR Lebron, LT Nobles represented the champion who understood his vision and knew how to turn it into an actionable reality. When asked how LT Nobles ended up eventually taking the lead on executing his vision for innovation aboard *Benfold*, CDR LeBron replied:

For starters, LT Nobles listened to what I wanted to do. And there was good critical mass, because he’s got an MBA background, just like I do. So we sort of spoke the same language. And he was very current on some of the more relevant MBAish type thinking. So we talked about how to move my vision [of getting the JOs to expand their mental horizons and think entrepreneurially] forward amongst the officers, particularly the Department heads. I think he, more than any of the others, was able to appreciate exactly where I was going without me expending a whole lot of effort explaining it beyond the simple statements that I made. And so, he came to me with, hey, how about this [wiki wardroom]? Well, it was already caged and packaged to meet the vision that I had already articulated He’s the one that stepped up with what I considered to be a very effective way to execute the vision within the framework of what I wanted to do. (CDR LeBron, interview, June 17, 2014)

After approving the “wiki wardroom” concept, CDR LeBron charged LT Nobles with selling it to the wardroom. Over the next week, LT Nobles prepared a brief outlining the concept, which he distilled into verbiage that any JO would appreciate: “You get the day off from your work to pursue any idea to fix a problem. The only price you pay for the day off is a five-minute presentation at an off-ship, casual location the following Friday” (Nobles, 2013). (See Appendix A for the original brief).

Not surprisingly, the idea was well received by the JOs and the stage was set to launch innovation aboard *Benfold*. The CO had established the vision, a key stakeholder had taken that vision and turned it into an actionable plan and the JOs were willing to support it. As the *Benfold* made her way back to San Diego, CDR LeBron, LT Nobles and the JOs waited with anticipation to see how “wiki wardroom” would unfold.

D. “WIKI WARDROOM”

1. Introduction

LT Nobles began preparing for the inaugural “wiki wardroom” event once the *Benfold* returned to San Diego in February 2013. As he began coordinating the logistical aspects of the event he realized that several key decisions were needed regarding venue, attire and event topics. Over the next several weeks, he and CDR LeBron worked together to resolve these critical context issues (i.e., logistics) and content issues (i.e., identifying suitable topics).

2. Run-Up to “Wiki Wardroom”

LT Nobles found coordinating the “wiki wardroom” event exhilarating. He spent a great deal of effort spreading the word, encouraging participation and mentoring the JOs as they developed their ideas. He recalls the weeks leading up to the event:

I socialized wiki wardroom with the JOs ... I started coaching up ideas and helping them develop their ideas ... kind of shaping the idea process and encouraging it For example, I remember sitting in the wardroom and overhearing Ensign (ENS) Harris and ENS McClenning talking about an idea [to improve acoustic recognition of surface contacts]. And I’m like, well, what about this? What would you do here? And we started talking. I’m like that’s a really good idea, and I encouraged them to keep pressing, to look more into this and to try that. I asked them to think bigger, dream bigger and pitch their idea at wiki wardroom. (LT Nobles, interview, May 30, 2014)

LT Nobles and CDR LeBron discussed “wiki wardroom frequently in the weeks prior to the event and ironed out several key considerations shaping the event. The first was subject matter: What kind of ideas and concepts would be suitable for “wiki wardroom”? CDR LeBron recalls that:

Initially we started looking at things like how we do business on the ship What we found is that when it came to the operating-the-ship kind of stuff [like fighting fire aboard the vessel or launching a missile] that it wasn’t worth it to try to change it because there are plenty of lessons written in blood and experience So we started looking at other areas like how can we do things a little differently, say, in the procurement of things or in the expression of ideas? Or in using the experiences that JOs

and junior Sailors have in operating equipment and standing watches to do things better. (CDR LeBron, interview, June 17, 2014).

CDR LeBron also approved LT Nobles' recommendations to have the venue off-ship, for the participants to wear civilian attire, and for participation to be strictly voluntary. These guiding principles were intended to increase the quality of the ideas by reducing the hierarchy and rigidity that normally govern military life and stifle creativity (LT Nobles, interview, May 30, 2014).

CDR LeBron also made a very conscious decision not to participate directly in "wiki wardroom" activities. He didn't want to put JOs in a position where they felt compelled to support an idea simply because it was the Captain's. Furthermore, direct participation in the event went against his command philosophy, which centered on his belief that "My role as Captain was to enable my team to do stuff. It was not to do it" (CDR LeBron, interview, June 17, 2014).

Thus, the stage was set for the first 'wiki-wardroom' event. Both CDR LeBron and LT Nobles had no idea how the day would unfold, but in true entrepreneurial fashion they went ahead with the plan (which at this point could be viewed as an experiment or prototype), eager to see what would transpire.

3. Event Overview

In mid-March 2014, the *Benfold* wardroom assembled at a local San Diego pizza joint to kick off 'wiki wardroom.' LT Nobles recalls the hours just prior to the start: "I was riddled with a crazy anxiety that I'd never felt before as I wondered if the JOs that we gave the day off to would actually bring good ideas to the table for the event. I hoped that they would bring the kind of ideas and solutions that I knew they were capable of. They did want this, right?" (LT Nobles, interview, May 30, 2014).

Much to LT Nobles' relief, nearly every *Benfold* JO voluntarily attended. There were 11 presentations given, most of which dealt with process improvements. LT Nobles recalls that scene: "It was just the wardroom and we kind of sat around in a circle. We ordered some pizzas and I got up, I was like, okay, well here we go ... The Captain said

some stuff and basically said that he'd shut the hell up and let us do the talking" (LT Nobles, interview, May 30, 2014).

Event highlights included a controversial ten-year Surface Warfare Officer (SWO) payback idea that led the JOs into a heated debate, as well as pitches on an energy conservation program and a peer-led SWO seminar. A program that enabled Ensigns to ask Ensigns in other commands questions that they would be apprehensive or embarrassed to ask more senior officers in their own commands was also well received by the JOs in attendance. There were also less popular pitches, such as one outlining how the *Benfold* could field a soccer team (LT Nobles, interview, May 30, 2014).

4. Event Highlight: SWO Payback Tour

LT Nobles keenly remembers the rather auspicious opening pitch, which he credits with perhaps giving "wiki wardroom" the buzz it needed to gain traction with the JOs (See Figure 7):

I remember the first pitch and how controversial it was ... our old Fire Control Officer and Weapons Officer pitched this idea of increasing the SWO commitment to ten years as a way of increasing retention and reducing manpower requirements. There were heated debates on the issue and folks were really engaged ... some felt that it was a great idea and others felt that it was awful. Looking back, I wonder if we had a real stinker idea initially would everybody have just deflated from the jump? Or was it because we had a truly disruptive idea that challenged the status quo in a big way that any of this [the future success of the project] was possible? (LT Nobles, interview, May 30, 2014)



Figure 7. *Benfold* JOs discussing ideas at the first “wiki wardroom” event
(from Nobles, 2013)

Lieutenant Junior Grade (LTJG) Kaitlin O’Donnell, the *Benfold’s* Training Officer, also remembers the event; in particular, the highly controversial first pitch:

It was an open atmosphere. It felt cool and different and we were discussing ideas. It did get very heated, especially that first pitch, because there were some very controversial ideas. There was this proposal that every SWO should be mandated to do ten years. That should be their minimum requirement. Ten years when they come in the fleet. Ten years flat. And then we won’t lose all these people and stuff. And I disagreed with that 100 percent because I felt that you’re just guaranteeing a job and that if people know they are going to be in for ten years that they’ll just sit on their butts for ten years and do nothing And it got us talking, but it was a discussion not some argument. And we would go back and forth and hear each other’s side ... and that discussion aspect likely never would have happened back on ship in the wardroom. (LTJG O’Donnell, interview, May 2, 2014)

5. Initial Reactions and Proposed Changes

The JOs who supported “wiki wardroom” felt that it was a worthwhile program and were excited to continue participating in future events. However, they also identified a few areas for improvement, and LT Nobles realized that as with all good prototypes, “wiki wardroom” needed some adjustments.

First, the pitch process had to be more disciplined. The first pitch (SWO payback tour) was so controversial and the discussion so lengthy that there was little time left to

hear the remaining pitches. LT Nobles realized that, “We needed to apply some controls. We discovered that we had to put a five minute cap on the question and answer period; otherwise, the event would drag on and people would lose interest.” (LT Nobles, interview, May 30, 2014)

LT Nobles also realized that there was no way to judge the quality of the ideas. He recalls how they overcame this shortcoming: “We didn’t have any voting mechanism at the time. So I thought peer voting would be a good idea to help everyone evaluate the quality of the ideas” (LT Nobles, interview, May 30, 2014). The idea of peer voting led to the creation of the Admiral Sims Award for Intellectual Courage. In future events, it would be awarded to the team with the best pitch as judged by the audience based upon the idea’s quality, actionability, and presentation. According to LT Nobles, he and CDR LeBron settled on that name for two reasons: one, to lend a “Navy feel” to the process, and two, to honor Admiral Sims who was a legendary Naval reformer and innovator (LT Nobles, personal correspondence, July 9, 2014).

In addition, there was the issue of what to do with the ideas once the pitches were made. CDR Day, the XO at the time, recalls: “We got together at a place called Basic Pizza and a bunch of JOs pitched their ideas and we were like Yeah! Now what? There was no real mechanism for follow-through; to develop the ideas further” (CDR Day, interview, May 2, 2014). Ensign Robert McClenning, the *Benfold’s* main propulsion officer, had a similar recollection:

So we had a day off and we all met up for pizza and we pitched our ideas And then we’re kind of like, hey, alright. We have some great ideas. Now what? There wasn’t really a process to do anything with the ideas after presenting them; there was no way to really convert them into reality. (ENS McClenning, interview, May 1, 2014)

The challenge of how to convert the ideas into reality after the pitch was one that would continue to plague LT Nobles. He knew that linking the Sailors’ ideas with organizations possessing technical and monetary resources was critical to the program’s long term success. After the first “wiki wardroom” event concluded, he began to envision the event itself as a way of establishing this bridge between Sailors who had the requirement with the organizations that could support them. This concept would become

a foundational element of event’s future design, for he realized that support for the project would cease if there were no way to convert ideas presented at the events into reality.

A seemingly insignificant, yet powerful, adjustment that also emerged from the “wiki wardroom” event was a name change (see Figure 8). About the only thing that all of the JOs who attended the first event could agree on was that the title needed to change — everyone hated ‘wiki wardroom.’ Ever-quick to seize an opportunity to improve, LT Nobles began searching for a more attractive and descriptive moniker. After some research he settled on project ATHENA because Athena is the Greek goddess of inspiration, wisdom and the arts. LT Nobles also recounts: “In legend ATHENA was also a shrewd companion of heroes on epic endeavors. And, if anyone’s ever tried to make change in the Navy, they can attest that it most certainly is an endeavor of epic proportions” (Nobles, 2013).



Figure 8. “Wiki wardroom” attendees discussing a new event name (from Nobles, 2013)

The final change resulting from the “wiki wardroom” event was the decision to expand the initiative to include *Benfold’s* enlisted members. Many of the crew members interviewed for this research assumed that the plan was always to start the initiative in the wardroom, then expand it to the Chief’s mess and then finally open it to the entire crew.

However, LT Nobles and CDR LeBron indicate that ATHENA was not originally designed that way. CDR LeBron recalls that:

It didn't take long for us to see the light, and really look at that ... and the question was why don't we go talk to the enlisted and see what ideas they have? And so, even though it wasn't necessarily the way we had initially thought about it, we got to the idea of involving the enlisted Sailors very quickly. (CDR LeBron, interview, June 17, 2014)

Thus, CDR LeBron, LT Nobles and the JOs supporting “wiki wardroom” began soliciting input from the enlisted ranks. Several JOs even teamed up with enlisted members to develop ideas. Additionally, CDR LeBron and LT Nobles ensured that the enlisted were invited to participate each time ATHENA was mentioned in all-hands formations or during any chance encounter they had with enlisted crewmembers who expressed an interest in participating in future events.

6. Conclusions

‘Wiki wardroom’ was a huge success. Despite a few dud presentations, the event proved to LT Nobles and CDR LeBron that the “wiki wardroom” model was a viable concept. It also provided them with valuable insights into how to make the process more effective in the future. The participating JOs gave LT Nobles overwhelmingly positive feedback, and CDR LeBron, who had observed the entire event, was so pleased with the results that he decided to allow LT Nobles to press on with the program. LT Nobles recalls speaking with CDR LeBron immediately following the event: “He was like that was awesome; great job. And he kind of encouraged me to keep going with the idea and encouraged me to do another event” (LT Nobles, interview, May 30, 2014). Thus, the stage was set for ATHENA II.

E. ATHENA II

1. Introduction

‘Wiki wardroom,’ which was now known as ATHENA I, was originally designed to be a quarterly event. The success of ATHENA I had convinced CDR LeBron to continue the program, and LT Nobles began planning the next event for mid-summer

2013. LT Nobles was eager to spread the word and increase involvement from the entire crew of the *Benfold* and from other ships stationed in San Diego. He would work tirelessly over the coming months to push the ATHENA story out to anyone who would listen, and his efforts would pay huge dividends.

2. Run-Up to the Event

From April through June 2013, LT Nobles pitched the ATHENA idea to several other ships on the San Diego waterfront. Additionally, in April, CDR LeBron used his connections with the Surface Navy Association (SNA) to secure an invitation for LT Nobles to brief ATHENA to their West Coast Board of Directors (LT Nobles, interview, July 9, 2014). Finally, in May, LT Nobles made contact with the University of Southern California's Institute for Creative Technologies (USC-ICT) and invited them to attend ATHENA II.

The USC-ICT is an academic research institute that “brings film and game industry artists together with computer and social scientists to study and develop immersive media for military training” (About USC-ICT, n.d.). The USC-ICT team was thus a perfect choice to be part of the deck plate-level ideas surfacing at ATHENA. They were the first of many research and development type organizations that would soon become fixtures at ATHENA events.

Thanks to the efforts of CDR LeBron, LT Nobles and the nascent cadre of ATHENA supporters (mostly *Benfold* JOs), interest in project ATHENA was spreading. LT Nobles sensed the increasing pressure and was determined to make ATHENA II an innovation platform for an even wider and more resource-laden audience.

3. Event Overview

ATHENA II occurred in July 2013 at an apartment rooftop belonging to one of the *Benfold's* JOs (see Figure 9). The improvements for meeting facilitation that were identified at ATHENA I were fully implemented for the second event, which was to run according to the following script: Presenters had five minutes to pitch their ideas, then had five minutes for a question and answer period. After all presentations were given, the

winning project would be awarded the Admiral Sims Award for Intellectual Courage, and the project owners would receive command support to develop their idea over the next quarter (LT Nobles, interview, May 30, 2014).

In attendance were most of the *Benfold* JOs, a smattering of *Benfold* enlisted, crew members from seven other ships based in San Diego, and two scientists from the USC-ICT. Twelve presentations were given over the course of the afternoon, and while there is no record of all of the pitches, the Admiral Sims Award for Intellectual Courage was presented to ENS Robert McClenning of the *Benfold* for his Environmental Acoustic Recognition System (EARS) (LT Nobles, 2013).



Figure 9. One of 12 “Pitches” presented at ATHENA II
(from Nobles, 2013)

4. Event Highlight: The EARS Concept

ENS McClenning recalls how he originally came up with the idea for EARS: “We were BS’ing in the wardroom about ways we could buy our way out of the Navy [laughing]. We just kind of threw out an idea and LT Nobles was like, ‘you’re joking, but it’s not actually a bad idea.’ So I said, well, OK, I guess I’ll present it at the next ATHENA event” (ENS McClenning, interview, May 1, 2014).

The EARS concept is based on an ARMY system that uses acoustic signatures to locate sniper fire and applies that concept to ships trying to identify surface contacts in low visibility. ENS McClenning recalls the idea behind EARS:

The Navy's policy on sound signals right now is, hey, put some guys top side, open up the hatches and have them listen for contacts. It's the equivalent of driving down a highway and sticking your head out the window to listen for other cars — it doesn't make sense. There are multiple radars and multiple optic systems, but why not multiple acoustic systems? The one thing they teach you as a SWO is rules of the road: sound signals. We don't have anything that enhances our ability to pick those things up. And I happened to remember that I had read an article about the Army's Boomerang program years ago and it was like, hey, you can just stick those on the bridgeway and that's all you would need [to enhance acoustic recognition of surface contacts in low visibility]. I did a little research and it actually looked like a pretty viable solution and I thought if the Army can do it better, why can't we? (ENS McClenning, interview, May 1, 2013)

When asked about the experience of pitching an idea at ATHENA and winning, the normally taciturn ENS McClenning perked up:

It was a little nerve racking. You're in front of your coworkers and your friends. And then there are also people from other ships and USC, and you want to present a good idea because you don't want to look like an idiot up there. So it was nerve racking, but once we got into the Q&A the USC guys jumped all over it [the EARS concept]. And really it just kind of started flowing. And they got excited about it and that really got me excited about it. (ENS McClenning, interview, May, 1, 2014)

The USC scientists in attendance were very interested in validating the EARS concept and immediately began working with ENS McClenning to prototype the idea in a proof of concept (see Figure 10). Over the next several months, he and the scientists at USC collaborated and exchanged ideas. Eventually, the USC team, using their own resources, developed a working prototype that demonstrated EARS as a viable technology (Nobles, 2013). (See Chapter III, Section N for current status of this project).



Figure 10. A researcher from the USC-ICT conducts a demonstration on an EARS prototype (from Nobles, 2013)

5. Growing Enlisted Participation

Many of the audience members participated in the event by presenting ideas; however, there were others in the crowd who came simply to observe and learn. One such observer was Sonar Technician 2 (ST2) Gina Stevens — one of the few *Benfold* enlisted Sailors to brave what many assumed was an ‘officer-only’ event. She recalls:

The CO and LT Nobles were looking to expand ATHENA and the obvious way to do it, which was actually the genius idea, was to include the enlisted [The event] was interesting and very informal. I thought ATHENA was a great concept and I liked some of the ideas presented at the event such as the EARS program. As a Sonar Tech, I kind of thought that using acoustic signals to track surface contacts was what we already do, but the idea was a little different; it was intriguing. (ST2 Stevens, interview, May 1, 2014)

However, she was not completely convinced that the officers had ATHENA dialed in exactly on target,

I think the biggest detractor for the ATHENA project is feasibility The idea of project ATHENA was great, but turning that idea into an actual feasible plan that produced innovative things was going to be difficult I thought they were aiming too high, because if you want to prove to big Navy that we can make a difference, you have to start small. We [the *Benfold*] can’t spend a billion dollars making a piece of equipment,

because we just don't have the capability of doing that at our level. (ST2 Stevens, interview, May 1, 2014)

Despite her initial concerns, ST2 Stevens would eventually become a full-fledged supporter of Project ATHENA. As one of the key participants in *Benfold* University, she possessed the right mindset to appreciate an innovation effort like ATHENA. Over the coming weeks and months, she became an outspoken proponent of the initiative and actively spread the word about project ATHENA among *Benfold's* junior enlisted ranks. Eventually, her enthusiasm for the program led her to develop and present an idea at ATEHNA III.

6. Conclusions

ATHENA II was a vast improvement on the original "wiki wardroom" event. In just four months, LT Nobles had transformed his original idea of having the JOs take a day off to think creatively into a well-developed program that offered Sailors a platform to link their requirements to an ever-expanding audience of innovators and support agencies. The fact that members of seven other ships attended — along with some of *Benfold's* enlisted crew and the scientists from USC — demonstrated to LT Nobles and CDR LeBron just how popular these innovative events were becoming.

They both began to realize project ATHENA's potential. CDR LeBron wanted to see ATHENA continue to grow and provide Sailors with a way to bridge their requirements with the organizations that could support them. LT Nobles wanted to continue focusing his efforts on expanding project ATHENA to other Navy units and support agencies in San Diego. This focus on growth would continue to absorb them both, and they would capitalize on several opportunities in the coming months to greatly increase project ATHENA's scope.

F. CONNECTIONS AND GROWTH: KEY ANCILLARY EVENTS PART 1

1. Introduction

While researching the events that led to the spread of project ATHENA, it became apparent to the researcher that several ancillary events contributed significantly to project

ATHENA's growth both internally and externally. While none of these events fit under the rubric of project ATHENA per se, they were pivotal in exposing the initiative to a larger and more diverse audience. These events served to increase overall support for project ATHENA by expanding participation from *Benfold's* enlisted ranks and from a larger number of commercial and public sector participants.

2. NWDC and the CRIC

Immediately following ATHENA II, The Navy Warfare Development Command (NWDC) contacted LT Nobles regarding project ATHENA. The individuals who made contact with him were members of the NWDC's 'skunk works' division known as the CNO's Rapid Innovation Cell (CRIC). The CRIC was created in 2012 "To provide junior leaders with an opportunity to identify and rapidly field emerging technologies that address the Navy's most pressing challenges. The CRIC capitalizes on the unique perspective and familiarity that junior leaders possess regarding revolutionary ideas and disruptive technologies" (About CRIC, n. d.).

With this type of mission statement it is not surprising that the members of the CRIC wanted to learn more about project ATHENA, since both organizations shared the objective of grassroots technological innovation. After a few introductory phone calls, the CRIC received permission from the NWDC to invite LT Nobles to participate in NWDC's IDEAFEST scheduled for late July 2013. LT Nobles recalls that the CRIC funded his travel expenses to IDEAFEST with the goal of having him both participate in the daily activities and lead a breakout discussion group on project ATHENA (LT Nobles, interview, May 30, 2014).

3. IDEAFEST

On July 31, 2013 NWDC's Innovation Department (which includes the CRIC) hosted its inaugural IDEAFEST in Hampton Roads, Virginia. The event was designed "To foster better communication [about innovation] up and down the chain of command by getting Sailors of all ranks together in a setting where everyone's voice can be heard" (About IDEAFEST, n. d.).

LT Nobles was able to attend the multi-day event with CDR LeBron's permission and funding from NWDC. IDEAFEST turned out to be a key enabler for project ATHENA because of the connections LT Nobles was able to make with both private and commercial industry. It also introduced LT Nobles to other innovators and innovation initiatives underway throughout the Navy.

One Navy-wide innovation effort that particularly interested LT Nobles was the TANG project. LT Nobles attended a discussion session hosted by the TANG participants and learned about this unique innovation effort that paired the Navy's submarine community with the commercial design firm IDEO. The innovation approach employed at TANG stressed identifying requirements from the deck plate level and developing solutions through IDEO's highly effective design thinking methodology. LT Nobles quickly recognized the similarities between project ATHENA and TANG: both innovation initiatives were designed to take ideas from end users (i.e. Sailors) and turn them into technological innovations that could be applied across the fleet. The meeting exposed LT Nobles to new ways of addressing innovation within the Navy, and inspired him to envision project ATHENA in even grander terms (LT Nobles, interview, May 30, 2014).

Another significant connection LT Nobles made at IDEAFEST was with Josh Kvavle, who had recently joined the CRIC from the Navy's Space and Naval Warfare Systems Command (SPAWAR). While the meeting was brief, the impact it had on the overall success of project ATHENA was enormous. Over the coming months, SPAWAR would become a major ATHENA supporter and would aid LT Nobles in addressing the 'what next?' issue discovered at the first ATHENA event. LT Nobles knew he needed to find a way to bridge the gap between the ideas generated at ATHENA and their development, and SPAWAR would prove to be a valuable resource in combating this persistent challenge.

4. Josh Kvavle and SPAWAR

Hanging from the wall of Josh Kvavle's San Diego office is a quote from Winston Churchill that sums up why he joined the CRIC and eventually became involved with project ATHENA:

A Hiatus exists between the inventor who knows what they could invent, if they only knew what was wanted, and the soldiers who know, or ought to know, what they want and would ask for it if they only knew how much science could do for them. We have never really bridged that gap yet. (J. Kvavle, personal communication, June 16, 2014)

In 2009, after receiving his PhD in electrical engineering from Brigham Young University, Josh began working as an engineer in SPAWAR's Advanced Photonic Technologies Branch located in San Diego. His job was to develop technological solutions to problems affecting the Navy's warships.

Josh had only been at the job for a few months when he and some of his fellow scientists noticed the very problem mentioned by Churchill over 70 years ago: there was a disconnect between the Sailors who could identify the requirements and the scientists who could design the technological solutions. Josh and his colleagues felt that much of this 'gap' was due to the fact that the two communities rarely interacted and knew very little about each other. Josh and his engineer colleagues were charged with designing cutting edge technology for warships that many of them had never even stepped foot on. Similarly, the average Sailor had very little understanding of what scientists with Josh's background and resources could do for them. Josh recalls the problem and his idea for addressing the "sailor-scientist gap":

A few of us at SPAWAR realized that we were ill equipped to do our jobs. We had all just graduated from college, and almost none of us knew the first thing about the Navy or doing R&D in it. So we started meeting periodically [starting in 2011] and discussing some of the biggest challenges we had in doing our jobs ... we called the group the Grassroots Science and Technology (S&T) group, and we led an effort where we developed a workshop, website and written guide to help us get better at our jobs. One of the most popular lessons we taught was how to learn warfighter needs, which led to our first "Learn Warfighter Needs" workshop which we conducted in August 2012. (J. Kvavle, personal correspondence, June 16, 2014)

Josh's work with the Grassroots S&T group, and in particular the "Learn Warfighter Needs" workshops, drew the attention of the CRIC who seems to have a knack for sniffing out burgeoning technological innovation related initiatives. After a few brief introductory emails and phone conversations, Josh was invited to become a member

of the CRIC in July 2013. Josh eagerly accepted, and his first engagement as a CRIC member was to attend IDEAFEST where he subsequently ran into LT Nobles and learned about project ATHENA. Over the course of the next few months, LT Nobles and Josh continued to collaborate, spawning a variety of mutually supporting initiatives that would do much to further project ATHENA and bridge the ‘Sailor-scientist gap.’

5. The Surface Navy Association West Coast Symposium

On August 22, 2013 CDR LeBron, LT Nobles and several *Benfold* crewmembers who had participated in ATHENA were invited to speak at the SNA’s West Coast Symposium. LT Nobles had briefed SNA’s Board of Directors the previous April, and the Board requested another brief for the symposium which typically drew large crowds from the military and commercial sectors.

The SNA was developed “To promote greater coordination and communication among those in the military, business and academic communities who share a common interest in Naval Surface Warfare and to support the activities of Surface Naval Forces” (About SNA, n. d.). SNA members who shared this interest in linking the Surface Navy with business and academia were a good target audience for LT Nobles and the *Benfold* innovators. Many SNA members were in positions of influence both inside and outside of the military, and LT Nobles hoped that a good pitch at the symposium would extend project ATHENA’s reach even further into the Navy and the commercial sector.

LT Nobles recalls conducting a panel discussion with CDR LeBron and several other JOs on project ATHENA that generated a lot of interest and questions from the crowd. The audience was composed of roughly 100 military retirees, active duty personnel and contractors (Raytheon, Lockheed, etc.), many of whom exchanged business cards with the *Benfold* presenters following the brief (LT Nobles, personal correspondence, July 9, 2014).

LT Nobles began the presentation with an overview of project ATHENA and was followed by several JOs who provided recaps of the ideas they had pitched at ATHENA events. One briefer, ENS McClenning, provided an update on his EARS concept, which won the Admiral Sims Award at ATHENA II and had been prototyped by the USC-ICT

team. ENS McClenning recalls that the overall reception was positive; however, he also recalls hearing a comment that was a sign of the latent resistance to innovation that lurks within most large bureaucratic organizations.

ENS McClenning remembers overhearing a Navy captain mentioning that people would take project ATHENA more seriously if there were a SWO-qualified Ensign giving the brief. At the time of the brief, ENS McClenning had not yet completed the training required to become SWO-qualified. This certification represents a major milestone in a JO's career and many in the Navy view a non-qualified SWO as less competent than one with that certification. Thus, obtaining the SWO certification is an intense area of focus for new JOs on their first fleet tours.

The captain's comment was therefore a two-fold rib at *Benfold's* innovation effort. First, it implied that the program wasn't as professional as it could be because it allowed non-qualified (i.e., less competent) SWOs to participate. Second, the comment implied that ENS McClenning should have been focusing his attention on passing his SWO qualifications instead of on innovating (ENS McClenning, interview, May 1, 2014).

6. Conclusion

Despite the Captain's comment, the SNA symposium event was by all accounts a huge success. And it was due in large measure to events like the SNA Symposium, IDEAFEST and to the connections made with organizations like the CRIC and SPAWAR that project ATHENA began to move out of the localized confines of the *Benfold* wardroom and into the Navy at large.

G. PROJECT ATHENA RISKS

1. Introduction

CDR LeBron was keen to capitalize on ATHENA's growth following ATHENA II, and was pleased with the effect it was having on his crew. He could see that they were becoming more invested in the command and expanding their mental horizons. He was particularly pleased that project ATHENA was helping to bring his vision for the *Benfold*

to life—his crew was starting to develop the mental capacity needed to think outside the boundaries of doctrine.

However, ATHENA's rapid growth both internally and externally came at a price: it increased risk. As the project grew, CDR LeBron had to ensure that the motives and design of project ATHENA fit within the confines of his personal vision and his legal responsibilities as a ship Captain. He wanted to continue supporting project ATHENA, but two aspects of the initiative were beginning to concern him: event venue, and how to increase vendor support in a legal and impartial manner.

2. Venue Risk

The venue issue had concerned CDR LeBron early on and was a continual point of contention between him and LT Nobles. LT Nobles felt that the venues for the first two ATHENA events (pizza restaurant and apartment rooftop) lacked sufficient energy and buzz to truly engage participants. He felt that a brewery would be a better location since the atmosphere was casual, the vibe would easily stimulate conversation and it was free (LT Nobles, interview, May 30, 2014).

CDR LeBron was concerned that hosting the event at a brewery might send the wrong message to higher headquarters:

The one thing that concerned me early on was venue. It was at a time where we [the Navy] were having a lot of alcohol related problems, and I thought maybe that it wasn't the best idea to have the ATHENA event at a brewery. And so I, from an optics perspective, which I tend to be very sensitive to, thought maybe this isn't the best idea. (CDR LeBron, interview, June 17, 2014)

As the *Benfold's* Captain, CDR LeBron had to remain cognizant of image and perception. He didn't want his Command to acquire a reputation for promoting alcohol, and certainly didn't want to deal with the fallout if an ATHENA participant were to land a DUI after leaving a command sponsored event hosted at a brewery. Thus, his challenge was to select a venue that fostered collaboration and yet wouldn't be perceived as a threat to good order and discipline.

3. Vendor Risk

As preparations got underway for ATHENA III, CDR LeBron saw that there would be much more participation from commercial industry at the third event. LT Nobles had used his growing network of connections cultivated at the CRIC, the SNA and SPAWAR to invite numerous DOD contractors and commercial businesses. This was something that CDR LeBron supported entirely since the Sailors presenting ideas at ATHENA needed the technical skill and financial resources of external agencies to convert their ideas into working technologies.

However, CDR LeBron had to ensure that he and the growing number of ATHENA supporters remained completely neutral with regards to vendor participation. CDR LeBron recalls:

The other thing that got me concerned was the potential for the perception that I as a Navy public figure, which as the commanding officer of a ship I am, was trying to exert any kind of influence on industry or give the impression that the government was supporting a particular company or member of industry. (CDR LeBron, interview, June 17, 2014)

Thus, CDR LeBron's challenge was to identify ways to increase vendor support (and therefore increase the likelihood that ideas would get converted to reality) while maintaining a stance of strict neutrality.

4. Risk Mitigation

CDR LeBron eventually realized that venue risk and vendor risk both stemmed from the issue of perception. By reframing these risks as a perception problem, he began to see that a negative impression would only emerge if those outside the command viewed project ATHENA as a CDR LeBron initiative or a USS *Benfold* program. The solution was to ensure that project ATHENA remained separate and distinct from any one personality or command. The key would be to promote an image of project ATHENA that reflected its true identity as an independent innovation initiative, not a program belonging to CDR LeBron, LT Nobles or the USS *Benfold*. This important distinction was always clearly articulated to participants, supporters and on project ATHENA's social media outlets.

This perspective allowed CDR LeBron to sufficiently mitigate the venue risk. He recalls how he came to accept the recommendation to host subsequent ATHENA events at breweries:

I listened to the crew who wanted it at a brewery and I eventually acquiesced and agreed to the brewery idea. Because I was always conscious of doing everything under the rubric of ATHENA, not *Benfold*. We did it under the rubric of this is an independent effort from the deck plates, not from the Navy. The optic of the independence of the effort was important to us. (CDR LeBron, interview, June 17, 2014)

This perspective also allowed CDR LeBron to mitigate vendor risk by ensuring that all vendors were allowed equal access to ATHENA events. He recalls his decision for pressing ahead with inviting vendors in a way that maintained neutrality:

So I did address our Judge Advocate General [on the vendor issue] and got some top cover there. We had to ensure that ATHENA was an open forum, and that everybody was invited. So, when we started inviting people, it was done on the blog and in emails that went to broad distribution lists. It was done openly and it was always communicated that ATHENA was above board and that everybody had an equal opportunity to participate And there was never any intention to say, oh, this idea needs to go Lockheed Martin, or to steer projects towards certain vendors ... ATHENA was open to whoever showed up, to whoever picked up on an idea and wanted to invest their own funds to develop it. (CDR LeBron, interview, June 17, 2014)

5. Conclusion

The decision to design and promote project ATHENA as an independent, Sailor-initiated, grassroots innovation effort enabled CDR LeBron to sufficiently mitigate the risks associated with ATHENA's rapid growth. Once these risks had been properly addressed, CDR LeBron made the decision to continue on with the project. He gave LT Nobles enormous autonomy to plan ATHENA III, and continued to allow his crew the time and resources they needed to participate in the growing innovation effort.

As LT Nobles began preparing for ATHENA III, he felt relieved that support and interest were growing, yet at the same time he still harbored a lingering fear that project ATHENA wasn't going to survive. He was concerned that ATHENA would not be able to bridge the gap separating the tactical level innovators from the strategic level leaders

who could support their ideas and convert them to reality. He didn't know if it had gained enough traction among the crew and external support agencies to expand beyond the good idea phase (LT Nobles, personal correspondence, July 9, 2014). ATHENA III, scheduled for October 2013, would be the litmus test.

H. ATHENA III

1. Introduction

As fall 2013 approached, the pieces started falling into place for the next project ATHENA event. Participation in ATHENA III was expected to be extremely high, and both CDR LeBron and LT Nobles felt that it would be the make-or-break event for project ATHENA. They knew that if the JOs and enlisted continued to present good ideas, and if there were enough support agencies in the audience willing to provide technical and financial backing for those ideas, then the project stood a good chance of surviving. If, however, participation from both the Sailors and the vendors was low, CDR LeBron and LT Nobles feared that project ATHENA might fizzle out like many other innovation initiatives before it.

2. Run-Up to the Event

In September 2013, as LT Nobles was busy coordinating logistics for ATHENA III, he received word that he had been selected to be a member of the CRIC. Admission to the CRIC involves a rigorous screening process and numerous command endorsements, and LT Nobles knew that CRIC membership would give him access to the highest echelons of the Navy. He knew that getting key leaders at that level to endorse project ATHENA would boost its chances for survival.

September was also a good month for following up on previous ATHENA projects and for further developing emerging relationships. In early September, Josh Kvavle and a team from SPAWAR toured the *Benfold*. They listened to impromptu briefs from numerous Sailors, and had the opportunity (many for the first time) to see how their technologies were actually employed aboard a warship. The visit gave the scientists a much better appreciation for the constraints of shipboard life, and helped many of them feel more connected to their users (J. Kvavle, personal correspondence, June 16, 2014).

Later in the month, LT Nobles and a team from *Benfold* visited the USC-ICT and received an update on ENS McClenning's EARS project, which had been presented at ATHENA II. The scientists at USC had developed a working EARS prototype and were soliciting funding to move the concept into full scale production (LT Nobles, personal correspondence, December 3, 2013).

As ATHENA III approached, LT Nobles sensed that it would firmly establish project ATHENA as a viable innovation platform. First, the ideas to be pitched at ATHENA III were strong. Participants were required to provide him with an overview of their projects as part of the scheduling process, and he had seen several ideas with potential Navy-wide application. Second, he noticed that an increasing number of enlisted crewmembers were participating in the event. His time spent encouraging CDR LeBron, the JOs and a few enlisted crewmembers like ST2 Stevens to spread the word that ATHENA was for everyone (not just officers) had apparently paid off. Finally, LT Nobles knew that a larger number of commercial entities would be participating in this event — in fact, most of the organizations he invited to ATHENA III had accepted.

Awareness about ATHENA was spreading throughout the *Benfold's* enlisted, the Navy and the commercial sector; there was a strong line-up of ideas ready to be pitched; and issues from the first two events had been ironed out. All these positives made LT Nobles feel confident that ATHENA III would be the best event yet.

3. Event Overview

On October 25, 2013 ATHENA III kicked off at Modern Times Brewery in San Diego (see Figure 11). In attendance were Sailors from approximately 15 commands, as well as members from numerous support organizations such as SPAWAR, USC-ICT, CRIC and Harris Corps. The following ten presentations were given over the course of the afternoon (Nobles, 2013):

1. Psychology-Driven Division Officer Assessments; LTJG Kaitlin O'Donnell; USS *Benfold*. Summary: Develop a survey similar to the Myers-Briggs survey to evaluate an officer's leadership potential.

2. Hydro Wave Power Generator; ET2 Erika Johnson; *USS Benfold*.
Summary: Use cranks and netting in the littorals to be used as both power generators and a passive sonar system.
3. Peer Resource Sharing; LTJG Sarah Eggleston; Destroyer Squadron One.
Summary: Develop a SharePoint-type automated system to share lessons learned and update Naval messages.
4. *Benfold* University CLEP; STG2 Gina Stevens; *USS Benfold*. Summary:
Use free resources provided by the Navy in support of the College Level Examination Program (CLEP) to help Sailors earn college credit for a variety of courses.
5. Active Sonar Defense; ENS Joshua Corpus; Basic Division Officer Corps (BDOC). Summary: Apply the technology used in noise-cancelling headphones aboard ships to aid in sonar defense.
6. Optical Database and Information Network (ODIN); FC2 Robert VanAllen, FC2 Michael Owen, FC2 Lisa Stamp; *USS Benfold* (Winner of the Admiral Sims Award). Summary: Create a database that helps identify surface contacts by combining information resident in other sensor databases. (See Event Highlight A for a detailed review of this project).
7. Electronic Division Officer Notebook; LTJG Isaac Wang; *USS Benfold*.
Summary: Digitize Division officer handbooks using existing technology.
8. Small Craft Action Team (SCAT) Heads Up Display; FC1 William Steele, FC2 Amanda Curfew, FC2 Justin Langenor, GM3 Jacob Niessen; *USS Benfold*. Summary: Utilize augmented reality headsets to facilitate communication between the bridge and crew served weapons handlers on the weather decks. (See Event Highlight B for a detailed review of this project).
9. Cosmogator; LT William Hughes; *USS Benfold*. Summary: Automate celestial navigation using a combination of existing technology. (See Event Highlight C for a detailed review of this project).
10. Metal Alloys for Energy; GM2 Robertson Acido; *USS Benfold*. Summary:
Use cutting edge technology currently being developed at the University of Minnesota to augment ship power generation.



Figure 11. Team ODIN pitching their idea at ATHENA III (from Nobles, 2013)

4. Event Highlight A: The ODIN Concept

ATHENA III was the first event in which there was heavy participation from the enlisted ranks, and in the true spirit of ATHENA, a team comprised entirely of Fire Controlman (FC) won the Admiral Sims Award for their Optical Database and Information Network (ODIN) concept. One member of Team ODIN recalls how they came up with their idea:

Honestly, it started out with bitching. We would complain about the problem and then one night we were literally outside on the smoke deck BS'ing and LT Nobles came out and overheard us Honestly when I told him, I didn't think it was a feasible idea, so I was basically just asking him if he thought it was possible And I described ODIN to him and he said yeah that's a great idea. You should bring it up at the next ATHENA event. (FC2 Van Allen, interview, May 1, 2014)

ODIN was designed to aid the crew in identifying surface contacts picked up by the ships' cameras. The original idea was to program the cameras to use algorithms to automatically classify surface contacts instead of relying on the crew to visually process the image and manually classify the contact. However, as the team researched camera software they began to realize that their original concept was too technologically

challenging, so they narrowed the scope. They team decided to shift their research to laptop-compatible optical recognition software packages that could interface with the ships' cameras. They eventually found a suitable software package and used it to develop ODIN. The ODIN process used the ships' cameras to feed images to computers loaded with this optical recognition software. The computer then automatically identified and classified the surface contact, thereby removing the human guesswork from the process (FC2 Van Allen, interview, May 1, 2014).

Another member of Team ODIN recalls how he joined the team and what it was like developing the idea and preparing for ATHENA III:

Van Allen and I were just BS'ing about it [ODIN] and while he had the big idea, I kind of had more of the technical skills, so he asked me if I'd help him out with his idea. Then he explained project ATHENA to me and I was like day off and beer? That sounds good to me ... [On our day off] we slept until like 11 or something and then went over to his house at noon for a BBQ. At around 2 pm we finally started talking about ODIN ... I had a laptop and we started looking at optical recognition software, and we kind of played around with it a did some tests, and it actually worked, just on the laptop. So we were like, man, this might actually work! (FC2 Owen, interview, May 1, 2014)

Once the team had validated the ODIN concept, they began preparing their pitch. They knew they only had five minutes to convince their audience, so they made sure the pitch was quick and to the point. When asked what it was like briefing ODIN at ATHENA III, FC2 Owen recalls:

I was kind of nervous; there were a lot more people there than I thought. And I walked in [to the venue] and was like oh my God, throw my ass to the wolves! But I started talking for three or four minutes and people were nodding their head and even by body language alone, you could tell they were digging what we were throwing down ... The guys from USC and the SPAWAR people, you could just see the eagerness in their faces. And they were asking questions and we got assaulted when we were done. We got jumped by those guys! (FC2 Owen, interview, May 1, 2014)

One of the people who "assaulted" the members of team ODIN following their pitch was Josh Kvavle along with some of his fellow scientists from SPAWAR. They immediately seized on the idea and began working with team ODIN over the following

months to develop the concept and eventually solicit funding to build a prototype. (See Chapter III, Section N for current status of this project).

5. Event Highlight B: The SCAT Heads-Up Display (HUD) Concept

The SCAT-HUD Team was also composed entirely of *Benfold* enlisted crewmembers. The four-member team developed a Small Craft Action Team (SCAT) Heads-Up Display (HUD) concept that was designed to improve command and control (C2) of the ship's SCAT.

The Ship's SCAT is a self-defense force which is charged with protecting the ship from attack by small assault craft. When activated, SCAT members man positions and weapons systems throughout the ship's weather decks to repel attackers attempting to damage or board the ship. Conditions on the weather decks are extreme, and often render line-of-sight radio and visual communications impossible. Thus, leaders are left with no choice but to coordinate the team's actions by physically moving to each member's location to communicate instructions and receive updates. This hampers C2 and diminishes the team's effectiveness.

The SCAT-HUD team addressed this problem by adapting technology used in Google Glass. Their technology-based C2 system would enable SCAT members to use a HUD device (similar to Google Glass) paired with headphones to communicate with other team members and leadership. Commanders could then use the device to quickly communicate with SCAT members without having to depend on unreliable line-of-sight radio or voice communications. The device would also improve SCAT members' situational awareness by providing them with an augmented reality environment depicting critical information about friendly and enemy forces. The augmented reality provided in the HUD would present the user with real-time information in a format similar to the first-person-shooter video games that many younger enlisted members are familiar with (FC1 Steele, interview, May 2, 2014).

FC2 Wagner recalls how he got involved in the project:

At morning quarters LT Nobles passed that there was a new project they were working on trying to figure out how to use Google Glass in the

Navy. And then they asked who was interested in doing it and I raised my hand The whole reason I signed up was because I wanted to get a chance to play with real Google Glasses. I didn't really know what the project was about, but when I got to the meeting I sort of figured it out. Everyone had their own ideas on how to use Google Glass, and we just started throwing out ideas. (FC2 Wagner, interview, May 2, 2014)

Several other enlisted Sailors raised their hand that day, mostly because they too wanted a chance to work with Google Glass. Initially, LT Nobles held a kickoff meeting to get the volunteers to think about ways to apply the technology in their daily activities. He had heard of Google Glass and thought that identifying military applications for the new technology would be a good topic to develop in an ATHENA project. FC1 Steele recalls the first meeting and how the idea for using Google Glass on the SCAT materialized:

So LT Nobles conducted the first meeting and kind of passed us the Google Glass idea. So we basically sat down and said, okay, what are the types of things or areas of the ship or the Navy that could use Google Glass? And so we talked about potentially using it for supply inventory or for seeing what was going on in a particular workspace on the ship. But most of the people at the meeting had experience with the SCAT and eventually we all started talking about how to use Google Glass on the SCAT ... And we started talking about what it was like being a SCAT member and what the environment is like- it's windy and loud and hot and it's hard to pass information; somebody has to run around to pass the word. And we thought well it would be easier if they used headphones and a heads up display. And so we thought about an augmented reality type thing that wasn't Google Glass necessarily, but that would use the heads up display concept ... I understood the concept of SCAT but had never been a member, so we relied on the people that had stood it to say, okay, here are the problems that you have, here's the information that would be helpful. And so we had a whiteboard and we went around the room talking about if you were a team member or a watch team leader on the bridge, what would you want to see? And for me personally, I don't stand any of those watches, but I'm good at user interface stuff, so I just kind of came at it from the user interface side. (FC1 Steele, interview, May 2, 2014)

After the initial meeting, the team members began researching and working on facets of the project that interested them. Periodically, the team members would meet to discuss their progress. FC2 Wagner recalls:

At the end of the first meeting the team had gotten focused in on how to use it [heads up display] for the SCAT. And narrowing it down to the SCAT was really helpful because there's specific information that those guys either want or need or are being pinged on for So I took the whiteboard drawing home [from the first meeting] and basically put it into a paint type program and produced an image of what I thought the heads-up-display would look like based off what we drew on the whiteboard So it was basically like a prototype drawing Then the team decided to take our ATHENA day off for brainstorming and we decided to meet at a bowling alley ... LT Nobles wasn't there because I guess he had just gotten us started and then turned it over to us So we all showed up. I think we had pizza and beer or something like that. And I brought my laptop to show the team what I had worked on, and we just sort of talked about it and changed what the picture looked like. One of the other team members had a cork board with cutouts, and we simulated the moving parts of the heads-up-display on the board We then went back and refined the concept some more and then had one more meeting I think, then we presented it at the ATHENA event. (FC2 Wagner, May 2, 2014)

The team presented their concept at ATHENA III and it generated considerable interest from the crowd. FC1 Steele recounts his experiences presenting the SCAT-HUD concept at the event:

I wasn't really intimidated because it was at a bar and everyone was in civilian clothes which sort of leveled the playing field There was still the rank thing but at the same time it was kind of like we're just a bunch of people here to brainstorm The atmosphere was open and I think that was the most important thing because I never felt afraid to say anything because people would make fun of me or something; it felt like there was no stupid answer. Honestly, when I first heard about ATHENA I didn't think it would be this way, I thought it was almost a gimmick of sorts But then, when I got to the actual event itself I saw who was there, like these PhD dudes and college dudes and stuff. And then on top of that they actually listened and asked questions and were genuinely interested. And they came up to us after the presentation and were like trying to help us out by asking questions, and that's when I realized like, oh man, this is cool. (FC1 Steele, interview, May 2, 2014)

Following the pitch, members of the USC-ICT and SPAWAR discussed the concept with the team, but there was little done to follow through on the idea. FC2 Wagner recalls:

After we presented we had members from two groups just spit balling ideas with us, like right there But there was no one there that could do

something with our project; there were lots of people there that could do stuff for the ODIN guys but not for us. I mean if a group had been there that could have done something with heads-up-display technology then it would have been different I guess. But for me, it [my participation in SCAT-HUD] stopped there at the ATHENA event. It sort of died out for me there, so I haven't talked to anyone about it until this interview. (FC2 Wagner, interview, May 2, 2014)

Currently, the project is active, but progressing slowly. LT Nobles is working with faculty at NPS to refine the heads-up-display's technical requirements. The process remains in the discussion phase, but he is hopeful to obtain funding from the Navy and technical support from NPS to develop the concept further (Nobles, personal correspondence, July 24, 2014).

6. Event Highlight C: The Cosmogator Concept

The Cosmogator concept presented by LT Hughes (see Figure 12) also garnered attention from the audience; particularly, from the SPAWAR scientists. LT Hughes was *Benfold's* Navigator, and his Cosmogator concept was developed as a way to improve night-time navigation without relying on Global Positioning System (GPS) technology.

LT Hughes recalls how he came up with the idea:

I can't tell you exactly what it was that made me come up with the Cosmogator idea. But I can say that it wasn't something that popped off in my head like a light bulb; it took shape over a period of time For me, space and the stars and that kind of stuff have always been interesting — I've always been kind of a space geek. When we were on deployment, CDR LeBron, who was big on everyone being well read, would wrap up our daily meetings by asking us to discuss something interesting with the group; it didn't have to be work related per se, as long as it was thought provoking. And I always made it a point to cruise through a couple different space websites and read a few articles on astrophysics and stuff before the meetings and I would mention them. And it became kind of a running joke like, oh the Navigator, he's the space guy And one day I'm looking at my phone and it has an ap[plication] where you can point up at the night sky, and based off the phone's GPS and internal accelerometer it'll will tell you what stars and planets you're looking at; like there's Venus kind of thing. So one day, everything just kind of clicked and it was like, hey, why can't we do this on a ship? If we can do it on my phone we should be able to do it on a ship. (LT Hughes, interview, May 6, 2014)

LT Hughes had been thinking of ways to provide an accurate position for the ship without relying on GPS. Currently, GPS is the mainstay of the Navy's positioning and tracking systems, and the data is used not only in determining the ship's location but is also fed into the ship's weapons systems which use GPS for targeting. He was concerned that if the GPS were unavailable (or denied by the enemy) that he would be forced to rely on celestial navigation to track the ship's position. Celestial navigation is extremely difficult, and using a calculator and sextant to determine location isn't very accurate. But, he realized that he could apply the same principles used in his phone's application to the ship — he could create an automated celestial navigation system that uses data from the ship's cameras to tie in with astronomical data to shoot visual lines of position at the stars and compute extremely precise sight reductions. These could then be used to calculate much more accurate locations; in fact, the calculations would be accurate enough for use by the ship's weapons systems.

Once LT Hughes formulated the basic idea for Cosmogator, he needed additional support to refine it. He recalls:

The big thing about Cosmogator is that it's nothing new. The cameras and the astronomical data, that's already out there; people already invented those things. It's just that nobody has put them together in one package for a warship before. But I needed help with that, so after I came up with the big idea part, I reached out to a few other people to make it better. Some of them were on the ship, like the Electronics Materials Officer, who owns all the navigation equipment. And some of them were off ship, like the guys from SPAWAR ... I was able to connect via Dave [LT Nobles] with SPAWAR's navigation and timing guys ... and they really helped me out. After ATHENA III, I ended up spending a day with them and we really improved Cosmogator. (LT Hughes, interview, May 6, 2014)

Cosmogator was well received by the crowd; but it, along with the other ideas pitched that day, was overshadowed by the ODIN concept. However, LT Hughes continued working on Cosmogator over the coming months. Through events that will be detailed in later sections, he and LT Nobles were eventually able to obtain significant funding from the CNO's office for prototype development. (See Chapter III, Section N for current status of this project).



Figure 12. LT Hughes pitching Cosmogator (from Nobles, 2013)

7. Conclusion

As LT Nobles watched events unfold at Modern Times Brewery, he began to sense that project ATHENA had finally arrived:

I think ATHENA III was really big. I felt it was the biggest risk ... because it was the first one where we really had enlisted pitching, where we had a lot more external agencies, and it was at a brewery which would become a standard for subsequent events. And it produced two of the big ideas [ODIN and Cosmogator] that still have traction today. (LT Nobles, interview, May 30, 2014)

CDR LeBron was also in attendance that day, and was highly impressed with ATHENA III. He was pleased that more enlisted members were participating, and felt that the ideas pitched exemplified the entrepreneurial thinking he had envisioned. He quickly made the decision to continue hosting future events, and authorized LT Nobles to begin planning ATHENA IV. As CDR LeBron looked toward ATHENA event(s) to come, he hoped that the growing number of support agencies attending these events would provide sufficient support to convert some of the ideas presented at ATHENA I, II and III into reality.

I. CONNECTIONS AND GROWTH: KEY ANCILLARY EVENTS PART 2

1. Introduction

As preparations began for ATHENA IV, a second set of ancillary events occurred that helped project ATHENA gain traction with the *Benfold's* crew, the Navy and commercial industry. In November, CDR LeBron and a select group of *Benfold* crewmembers traveled to Silicon Valley to tour companies like Apple and Google. In early January, Josh Kvavle and the SPAWAR scientists hosted a collaboration day designed to bridge the Sailor-scientist gap. And, later in January, LT Nobles briefed project ATHENA to a large gathering of DOD personnel and defense industry partners attending the Armed Forces Communication and Electronics Association (AFCEA) convention in San Diego. These events helped expose the *Benfold's* innovators to a larger audience and were critical in enabling project ATHENA to maintain momentum towards ATHENA IV.

2. The Silicon Valley Trip: “Milicon Valley”

CDR LeBron had always wanted to visit the innovation capital of the United States to see Apple's headquarters, and had even mentioned it to his staff the day he took command. He was eager to expose his JOs to the unique culture and mindset that make Silicon Valley a magnet for some of the best and most innovative minds in the world. However, a successful trip required a lot of coordination, and CDR LeBron had to ensure that all legal aspects (most of which revolved around funding) were in order. CDR LeBron recalls the trip:

On my first day of command I [told the staff] that I wanted to take the wardroom on a field trip to Apple. Well one of my JOs took that goal and ran with it. From a visit to Apple which was the only thing I had mentioned, he turned it into a visit to Silicon Valley, where we visited Apple, Google, Cisco, the Ames NASA Research Center, Tesla, IDEO and a few other high-flying fast companies And I got some resistance from my chain of command whose first question was funding. And so of course we self-funded it. We all drove our own vehicles and paid for our own hotel rooms and everything else. (CDR LeBron, interview, June 17, 2014)

Planning and coordination for the trip took several months, but eventually, in November, CDR LeBron and approximately a dozen JOs and enlisted crewmembers departed San Diego for the four-day trip to Silicon Valley. ST2 Stephens was one of the few enlisted members on the excursion and remembers learning a great deal about innovation — particularly from the visit to IDEO:

There were 13 of us, mostly officers, and I was asked to come as well So I paid for my gas and we drove up there and we paid for our lodging. And it was a nice four-day event where we went to different companies like Cisco and others The highlight of the trip was IDEO, I loved IDEO and their idea of rapid prototyping and failing quickly ... I thought it made a lot of sense and could work well in our [the Navy] environment. (ST2 Stephens, interview, May 1, 2014)

The trip was a great success and the participants returned to San Diego energized and ready to continue innovating and supporting the culture shift underway aboard *Benfold*. LT Nobles was unable to attend because he was participating in a CRIC event on the East Coast. However, he heard the positive feedback from those who did attend, and couldn't help but think of the trip as an example of a phrase he had heard coined by a member of the CRIC: "Milicon Valley" (LT Nobles, interview, May 30, 2014). He knew that those who had just come from Silicon Valley would be ready allies in helping him spread the word about project ATHENA, and in inspiring a "Milicon Valley" culture shift throughout the San Diego waterfront and perhaps even the Navy.

3. The Learn Warfighter Needs Workshop

In early December, Josh Kvale contacted LT Nobles to discuss ways they could bridge the 'Sailor-scientist gap.' After a visit to the ship and brainstorming with some of *Benfold's* ATHENA participants, the group decided to dedicate a full day to addressing this issue.

LTJG O'Donnell became the lead *Benfold* coordinator for the event, which was yet to be named, and recalls working with Josh on developing the idea:

Josh contacted us and was like hey, for the past two years, I've done this thing called Learn Warfighter Needs. It's a two-hour session where I teach my scientists who design all this stuff for you about what it means to be on a ship. Because they design all your technology but many have never set

foot on a ship And I thought that's crazy! And then I told him hey, we need to know what goes into your process building new technology as well because every day we're like, man, I wish my console could do this, or I wish my gun could do this. But we [the Sailors] don't understand the process behind it. So we thought what if we did a combined day, scientists and Sailors, and we get together and teach each other [about our worlds] and create new ideas? (LTJG O'Donnell, interview, May 2, 2014)

Throughout December 2013, Josh and LTJG O'Donnell finalized the details for the event that they eventually named the Meet Warfighter Needs Workshop (piggy backing on the name Josh already used for his Grassroots S&T seminars). SPAWAR would host the event in early 2014. The purpose was simple: To make the Navy better by bridging the 'Sailor-scientist gap.' The day would start with '101 briefs' by each community, a tour of SPAWAR's expansive research development testing and evaluation (RDT&E) facilities throughout the San Diego area, and would conclude in the afternoon with a brainstorming/ideation session in which scientists would pair up with Sailors and work on problems in their respective functional areas (LTJG O'Donnell, 2014).

On January 14, 2014 approximately 30 *Benfold* crewmembers met up with Josh and his group of approximately 30 scientists at SPAWAR's Systems Center Pacific headquarters in San Diego (See Figure 13). Josh provided each participant with a packet containing background information, the agenda, as well as some documents to be used during the afternoon brainstorming/ideation session. (See Appendix B for the complete Learn Warfighter Needs Handout).



Figure 13. *Benfold* crew and SPAWAR scientists at the Learn Warfighter Needs Workshop (from Nobles, 2014)

As Josh recalls, he opened up the event with a very clear purpose statement: “Our purpose today is to give warfighters and technologists a chance to work together in a *design thinking* framework” (J. Kvavle, personal correspondence, June, 16, 2014). Specifically, he wanted to highlight the unique RDT&E capabilities and project funding opportunities SPAWAR could provide innovative Sailors, and he wanted to give Sailors an opportunity to experience real-time innovation utilizing the latest in design thinking tools and techniques.

The day’s sequence of events unfolded as Josh and LTJG O’Donnell had expected: ‘101-briefs’, tours of SPAWAR’s RDT&E facilities and an afternoon design thinking brainstorming session (see Figure 14). However, they were not expecting the incredibly enthusiastic response they received from the participants. ST2 Stevens recalls:

So we went to SPAWAR and we all had a great time. We met with our scientists and it was a really cool idea, and it’s an idea that I back fully — getting our Sailors together with our scientists ... because often they [scientists] have no actual idea of the physicality of our working environment. (ST2 Stevens, interview, May 1, 2014)

LT Bill Hughes, the *Benfold’s* navigator, was also in attendance. He used the Learn Warfighter Needs day as an opportunity to meet with SPAWAR scientists who could help him with his Cosmogator idea:

So we broke up into an ideation session in small groups and I met up with the [navigation and timing] guys ... and I was like, hey, I’ve got this idea [Cosmogator] that I’ve already done all this work on. Let’s do some more on it So we found a conference room and sat there with our notebooks, just hammering out notes and ... discussing the idea And at the end we built a prototype using poster board and construction paper ... and the scientists were pretty psyched about it and gave me a lot of good, valuable insight on it. (LT Hughes, interview, May 6, 2014)

The success of the Learn Warfighter Needs Workshop and the support it generated among both the Sailors and the scientists led LTJG O’Donnell to envision a Navy-wide program that would facilitate bridging the ‘Sailor-scientist gap.’ As she and LT Nobles recounted the day’s events and started thinking about Navy-wide applications they quickly realized that this concept would be a perfect ATHENA project. Throughout

late January early February 2014, she and LT Nobles refined their idea and prepared to pitch it at ATHENA IV, scheduled for February, 2014.



Figure 14. A ‘pitch’ at the Learn Warfighter Needs Workshop
(from Nobles, 2014)

4. The AFCEA Brief

In late January 2014, as LT Nobles was preparing for ATHENA IV, The Armed Forces Communication and Electronics Association (AFCEA) invited him to present an ATHENA brief at their annual West Coast Convention. One of LT Nobles’ contacts at the CRIC had ties to AFCEA, and had recommended him as a guest speaker.

AFCEA is “A non-profit international organization ... that is dedicated to increasing knowledge through the exploration of issues relevant to its members in information technology, communications and electronics ... and opening dialogue and strong relationships between government and industry” (About AFCEA, n. d.). Their annual West Coast trade show and convention attracts hundreds of key members from the military, government and the commercial sector who are interested in technology-driven ideas. LT Nobles and CDR LeBron realized that the convention offered a great forum to increase exposure for the project and to solicit backing for innovative technologies like EARS, Cosmogator and ODIN (LT Nobles, personal correspondence, July 9, 2014).

In late January 2014, LT Nobles, CDR LeBron, and a group of *Benfold* enlisted Sailors and JOs gathered at the San Diego Convention Center to brief project ATHENA. They led a panel discussion with the approximately 100 attendees, many of whom were from the defense industry sector. The brief was well received, and while none of the vendors offered to support an ATHENA concept, the brief enabled LT Nobles to establish important ties with industry powerhouses like Lockheed Martin, Adobe, Harris, and Microsoft (LT Nobles, personal correspondence, July 18, 2014).

5. Dinner with Rear Admiral Rowden

The brief also helped LT Nobles and ATHENA supporters establish important links with key individuals within the Navy. The Director of Surface Warfare, Rear Admiral Thomas Rowden, got wind of project ATHENA while attending the AFCEA conference. He was keenly interested in understanding grassroots innovation efforts happening within the surface Navy, and invited the *Benfold's* ATHENA team to dinner in San Diego to discuss the initiative. LT Nobles clearly recalls dinner with the admiral:

And so you have this young energy going on at the deck plates where young Sailors want to create, they want to have ideas, they want to be heard. And then you have really senior leadership that want to hear Sailor's ideas So, the CO, XO, me and about a half dozen other ATHENA participants met Admiral Rowden for dinner at a Mexican restaurant in Coronado to discuss project ATHENA And we're talking about things, and telling him that this is messed up and we could do better in this area etc.... And I got the feeling that he really wanted to hear this stuff ... and I mean, damn, if we would have tried that before, before ATHENA, it would have been, it just wouldn't ever have happened. (LT Nobles, interview, May 30, 2014)

6. Conclusion

While nothing directly tangible materialized from these events in terms of funding or prototype development, they served as critical enablers that fueled project ATHENA's growth throughout the Navy and DOD industry sector. The connections and exposure resulting from the "Milicon Valley" trip, the Learn Warfighter Needs Workshop, the AFCEA West convention and the dinner with Rear Admiral Rowden helped place project ATHENA on a trajectory with the potential to reach throughout the Navy and beyond. LT

Nobles knew that ATHENA IV, scheduled for mid-February, would serve as yet another litmus test signaling whether project ATHENA was simply a fluke or something far more substantial.

J. ATHENA IV

1. Introduction

As the new year commenced, LT Nobles sensed ATHENA growing aboard the *Benfold* and knew that it was reaching the critical mass of internal and external support needed to give it true staying power. While he was still awaiting delivery of a ‘black box’ product that could prove ATHENA’s value, he remained optimistic that ATHENA IV would give vendors a great opportunity to hear a pitch they liked and quickly make it a reality.

2. Event Overview

On February 13, 2014 the fourth installment of project ATHENA kicked off at the Ballast Point Brewery in San Diego (see Figure 15). LT Nobles opted to move the event forward a few weeks (and risked losing attendees to Valentine’s Day) in order to capitalize on the large number of industry representatives in town attending the AFCEA conference.

His gamble paid off. The crowd of approximately 80 people was the largest yet, and the energy and buzz were palpable. Sailors from over 20 San Diego-based commands were in attendance, along with dozens of representatives from the government and commercial sector including industry heavy weights such as Harris Corporation, Lockheed Martin, CUBIC Corporation, iENCON, NASA and GovAlert (LT Nobles, personal correspondence July 9, 2014).



Figure 15. ATHENA IV question and answer session (from Nobles, 2014)

As the crowd mingled and settled in, LT Nobles took center stage and started things off by picking the first presenters. Throughout the afternoon the following nine ideas were presented (Nobles, 2014):

1. Veteran's Employment Transition Software; FCC Christopher Roberts; *USS Benfold*. Summary: Use existing software to make it easier for transitioning veterans to find employment following retirement.
2. Re-Usable Packaging; LTJG Wang; *USS Benfold*. Summary: Use state of the art storage containers to store repair parts and combustible materials in a more safe and efficient manner.
3. Tankless Water Heaters; ENS Thomas Baker; *USS Benfold*. Summary: Make shipboard water heating operations more efficient and cost effective by utilizing tankless water heaters. (See Event Highlight A for a detailed review of this project).
4. 3D Printing for Material Validations; CMDCM Sean Snyder. Summary: Use existing software to facilitate equipment validation and repairs.
5. MILES for the Navy; ETC Michael Lesisson; *USS Benfold*. Summary: Improve Navy training by incorporating technology already used by the ARMY (MILES gear).

6. Virtual Reality for CIC Watch standers; GMC Kyle Zimmerman; *USS Benfold*. Summary: Use virtual reality technology to improve situational awareness in the ship's Combat Information Center. (Note: This idea was spawned at the Learn Warfighter Needs Workshop).
7. Maintenance Software Systems Integration; CT2 Anna Nothnagel; *USS Benfold*. Summary: Use mobile software applications resident in the aviation community to improve surface ship supply and maintenance operations.
8. Logic Training for Sailors; ET2 Erika Johnson. Summary: Educate Sailors in the philosophical principles of logic to improve their decision-making abilities.
9. PartnerShips (Admiral Sims Award Winner); LTJG Kaitlin O'Donnell and LT Dave Nobles; *USS Benfold*. Bridge the 'Sailor-scientist gap' by connecting the two communities through a website-based system that enables individuals to seek out and connect with Sailors or scientists who can help them.

The PartnerShips project won the Admiral Sims Award, but ENS Baker's Tankless Water Heater idea (see Figure 16) stimulated a great deal of conversation among the crowd and generated interest from the SPAWAR scientists.

3. Event Highlight A: The Tankless Water Heater Concept

The Tankless Water Heater concept was developed by ENS Baker who reported to the *Benfold* in July 2013. As a new JO arriving at his first ship, ENS Baker was eager to contribute and recounts how he became involved in project ATHENA:

The ATHENA concept instantly interested me because my Major in college was entrepreneurship ... I didn't expect to find something like that [ATHENA] in the Navy ... so the challenge for me was that I wanted to be a part of it, but I had little knowledge of the Navy itself or improvements that were needed So I went to the [ATHENA] events just as a listener and a voter. And then I kind of gained confidence about some challenges that the ship faced; there were some improvements that I saw were needed. (ENS Baker, interview, May 2, 2014)

One area where he saw a need for improvement was in energy conservation. When ENS Baker reported to the *Benfold*, he noticed that enormous amounts of energy were wasted heating water in a central location and then piping it throughout the ship.

The water often cooled in the pipes before it could be used, and the inefficient process used energy needlessly and often resulted in Sailors having to take cold showers. ENS Baker brought the problem to Fire Control Chief (FCC) Roberts, who was the *Benfold's* energy manager.

FCC Roberts worked with him over the next months to develop a solution that reduced energy usage and improved Sailor morale. Their idea was to place tankless water heaters throughout the ship that would heat water when and where it was needed. This would make the water heating process more efficient by making it demand-based and by bringing the heating source closer to the user's location.

ENS Baker recalls how he identified the problem and worked with FCC Roberts on developing the solution:

On the *Benfold* we're required to provide wardroom training to the JOs about topics other than just SWO stuff. One of the things I've always been interested in is innovation. So I was researching IDEO because I had heard about them in college and wanted to do my wardroom training on innovation And one day I was having a conversation with Chief Roberts on energy conservation which is another one of my interests ... I was talking to him about IDEO and energy conservation and we started out with complaints, like look at how much energy we waste keeping lights on all day in places where no one uses them. And then we started bitching about running water and cold showers And then, he sort of half-jokingly asked me what my ATHENA solution was, and suddenly the conversation went from us complaining about the problem to saying wait a second, there's something out there to fix it. And so we started talking about instant hot water heaters And that one conversation flipped it completely around for me. I remember getting super excited by the end of it to go home and start researching stuff. (ENS Baker, interview, May 2, 2014)

FCC Roberts tells how he worked with ENS Baker developing their idea:

The water temperature fluctuates on a ship and it sucks; when you're taking a shower and, you know, you go from male to female and it's just not good. It's bad for morale [laughing]! So he [ENS Baker] came to me with the idea for using tankless water heaters to reduce energy waste and I told him to take a look at the details Our development process wasn't so much post it notes type brainstorming, but it was a very methodical approach We were brainstorming ideas in the passageway and there were pipes right there, I mean the lab was right in front of us. The waste of

water and energy was sitting right there! So we started walking the ship's spaces and saying yeah you could put one [a tankless water heater] right there, and another one right there, and we started imagining how that would start reducing the piping over our heads. (FCC Roberts, interview, May 1, 2014)

The two worked over several months to refine the concept, and the crowd at ATHENA IV liked their idea. ENS Baker recalls pitching the tankless water heater concept:

Chief Roberts kind of let me do the presentation. I went up there and talked and Chief was answering technical questions. But there were guys there from SPAWAR and they came up to me afterward, and met with me. We sat down and had a beer and we went over, you know, like the technical feasibility. I had a scientist and an engineer right there saying this is why we design it that way on a ship and why your idea could work and why it might not work. And that moment instantly motivated me To have the immediate feedback from guys with PhDs who can tell you that it's not going to work because of this thing you never even knew about. It saved me a lot of wasted effort, and they showed me how to adapt the idea to make it work (ENS Baker, interview, May 2, 2014).



Figure 16. The crowd listening to ENS Baker's 'pitch' (from Nobles, 2014)

The SPAWAR scientists collaborated with ENS Baker and FCC Roberts over the next several months to refine the concept. Eventually, SPAWAR loaned ENS Baker an expensive piece of equipment that he's currently using to gather baseline water heating energy consumption data. The next step will be to obtain funding to conduct a pilot test.

To date they have been unsuccessful in securing funding, but ENS Baker, FCC Roberts and the team from SPAWAR remain hopeful (ENS Baker, interview, May 2, 2014).

4. Conclusions

As ATHENA IV concluded, LT Nobles felt relieved that the planning and effort he and the other ATHENA supporters had poured into the project were finally paying dividends. It was inching closer to becoming a Navy-wide name through the connections made at the CRIC, AFCEA, SNA, SPAWAR, and the hundreds of Sailors who had become part of the ATHENA team (LT Nobles, personal correspondence, July 9, 2014).

However, despite these recent successes, project ATHENA still needed to demonstrate solid proof that it was a viable innovation platform. Otherwise it was still just a grassroots innovation effort aboard one ship with the good fortune of having a forward-looking entrepreneurial CO and a great team of innovators. What would happen if this team-dynamic were disrupted? Would project ATHENA survive if a key member of the team were to leave? LT Nobles and the group of deck plate innovators aboard *Benfold* would soon find out — CDR LeBron would be relinquishing command in March.

K. COMMANDER DAY

On March 14, 2014 CDR LeBron relinquished command of the *USS Benfold* to CDR Michele Day. CDR Day had served as the *Benfold* XO for the previous 18 months and was completely committed to project ATHENA. She had been there since its inception and had actively supported LT Nobles and the crew in their ATHENA endeavors, and had attended every event alongside CDR LeBron.

CDR Day's background as a female in the surface Navy gave her a unique perspective, and deeply influenced her motivation for continuing to support ATHENA as the new CO:

I tend to look at everything from a different lens, just because of always being the only female in the room Because being the only female in most every situation, you get left out of a lot of stuff. That sucks My experience in the military has been very different ... and so I'm always on the lookout for proof of care ... the 'give a shit' factor And for me that

was my big question — where did this cultural shift we see today happen, where your job is not a direct reflection of who you are? Because many of the Sailors today don't see it that way. They see their job as a job, if they screwed up, well, alright. But it is just a job. Whereas, when I was a JO, in my department if I found out I had not dotted a an 'i' or crossed a 't', it was 'oh my God', it was soul crushing. And so my question for years has been how do you get that 'give a shit' factor back They volunteered to do this. Nobody forced them to be here. This is a volunteer organization, so you would think that that would be enough in and of itself, but often it isn't And so ATHENA is a great way of achieving my goal of getting a group of people to collaborate and think creatively and to 'give a shit' about their job. That's my goal But the only way you get that is if they feel like they're a part of the solution; and that they have a voice. (CDR Day, interview, May 2, 2014)

Luckily, the continuity in command of the *Benfold* did not disturb project ATHENA's team dynamic. Under CDR Day's command, ATHENA remained unchanged, and LT Nobles and his team of innovators were allowed to continue innovating and executing ATHENA events.

L. ATHENA V

1. Introduction

Project ATHENA's momentum was strong following the fourth ATHENA event and LT Nobles wanted to maintain it for ATHENA V which was scheduled for late May. He was thankful that the new commander hadn't done anything to jeopardize ATHENA's future, and hoped that the growing number of commercial companies he had invited to ATHENA V would lead to significant backing for some of the ideas that were scheduled to be pitched at the event.

2. Run-Up to the Event

In early May, LT Nobles received a call from the CRIC who invited him to Washington, DC to brief the CNO on the Cosmogator idea. The CRIC was preparing their annual brief for the CNO, and many felt that the Cosmogator idea was a good candidate for Fiscal Year 2015 funding.

LT Nobles immediately sat down with the Cosmogator's originator, LT Hughes, and produced a white paper outlining the project's history and current status. The status was exactly the same as many other fresh innovative ideas coming out of ATHENA: "awaiting funding." As LT Nobles headed for Washington, DC he grew excited at the prospect of getting support, perhaps even funding, for an idea spawned at ATHENA. He remained ever-cognizant of the fact that after over a year of ATHENA events there was still nothing tangible to show for it. He and the ATHENA team desperately needed a 'black box' that they could point to as proof that their ideas could become reality, and briefing the CNO offered them the break they needed (LT Nobles, personal correspondence, July 9, 2014).

The brief to the CNO was a resounding success. LT Nobles recalls providing the CNO with the basic concept and detailing the project's requirements (which included an estimated two million dollars in research and development):

I briefed the CNO actual on Cosmogator, and then I gave him an overview of project ATHENA. I'm sitting right there face-to-face with him and I'm like Admiral, here's the problem. Here's what we need to do. And what does he do? He's looking at me, digging what I am saying, and he turns around and glances at his staff and then back to me and says something to the effect of, "This [project ATHENA] is excellent. When I see something like this, I can't help but wonder why we haven't we been doing this for the past 20 years?" (LT Nobles, personal correspondence, July 24, 2014)

LT Nobles' brief persuaded the CNO to provide sufficient funding to develop the multi-million dollar Cosmogator concept. LT Nobles was thrilled with the news and quickly informed the ATHENA team of their first big win. Finally, after over a year of effort, they had tangible proof that a grassroots innovation effort like project ATHENA could propel an idea from the deck plates to the highest level of the Navy. Project ATHENA had finally cleared the funding hurdle, and over the coming months LT Hughes and the SPAWAR team would use the CNO's funding to begin turning the Cosmogator concept into reality (LT Nobles, personal correspondence, July 19, 2014).

3. Event Overview

LT Nobles immediately resumed preparations for ATHENA V upon returning

from the CNO brief. He sent invites out to friends, other ships, contractors, industry and to the “regulars”—USC ICT, SPAWAR, and the CRIC. As he tallied the RSVPs and reviewed the scheduled pitches, he was pleased to see that both participation and idea quality remained high. He was also thankful that he would be able to provide the crowd with positive news on previous ATHENA ideas that were gaining support, and in the case of Cosmogator, even funding.

Early in the afternoon of May 30, 2014, a crowd of approximately 50 Sailors and defense industry representatives converged at Societe Brewing Co. in San Diego for ATHENA V (See Figure 17).



Figure 17. LT Nobles kicks off ATHENA V (from Nobles, 2014)

While the turnout was lower than anticipated, the crowd was still highly energetic and the ideas that were pitched truly captured the spirit of project ATHENA. The day started off with demonstrations from various commercial vendors and a prototype demonstration given by Lockheed Martin and CT2 Nothnagel on her Maintenance Software Integration idea originally pitched at ATHENA IV (see Figure 18).



Figure 18. Prototype demonstration of an ATHENA IV idea
(from Nobles, 2014)

After the demonstrations, the first of eleven presenters from four different commands took the stage to pitch their idea. The following ideas were presented over the course of the afternoon:

1. UAV Integration; ENS Paul Paquariello, USS SAN DIEGO. Summary: Use ship-launched Unmanned Aerial Vehicles to extend the operational reach of surface vessels.
2. Shipboard Energy Competitions; FCC Chris Roberts; *USS Benfold*. Summary: Broadcast each ship's electrical usage to the entire waterfront in an effort to reduce energy waste.
3. Real Time Maintenance; LTJG Isaac Wang; *USS Benfold*. Summary: Improve maintenance card administration through the use of QR coding equipment and image recognition software.
4. Solar Roadways; SN John Fellows; Assault Craft Unit-1. Summary: Apply solar roadway technology to U.S. Navy Bases in order to save energy (millions of kilowatt hours annually).
5. Integrated Accountability System; STGC Scott Christ & CT2 Anna Nothnagel; *USS Benfold*. Summary: Use scanners and ID cards instead of manual methods to track meeting attendance, tool issue/return, and maintain personnel accountability.
6. Internship for Sailors; CDR Michele Day; *USS Benfold*. Summary: Use internships in the private sector to augment service member professional

development. (See Event Highlight A for a detailed review of this project).

7. Anti-Torpedo Countermeasure; STG3 Michael Zujkowski; *USS Benfold*. Summary: Use an underwater self-propelled net to ‘catch’ inbound torpedoes.
8. Fleet Tactical Talk-to-Chat; LTJG Rob McClenning; *USS Benfold*. Summary: Utilize a computerized system instead of a manual process to translate codes used in inter-ship communication during tactical maneuvers.
9. Motorcycle Buy Back Program; FC2 Zachary Quirk & FC3 Adam Roter; *USS RUSSELL*. Summary: In an effort to curb motorcycle fatalities/injuries, the Navy could buy back used motorcycles from service members who could then use the money to purchase safer means of transportation.
10. No More Waiting; ENS Claire Calkins & ENS Nick Mann; *USS Benfold*. Summary: Use technology employed by restaurants (check-in kiosk and buzzing device) to reduce Sailor wait time. Instead of sitting in a waiting area to get a signature for example, the Sailor could sign in, get a buzzer and then continue on with other activities until buzzed.
11. Electrical Safety Tool; EM2 Susan Pavao; *USS Benfold* (Admiral Sims Award winner). Summary: Use a government issued pen instead of expensive and cumbersome equipment to switch out a common light bulb quickly and effectively (See Figure 19).

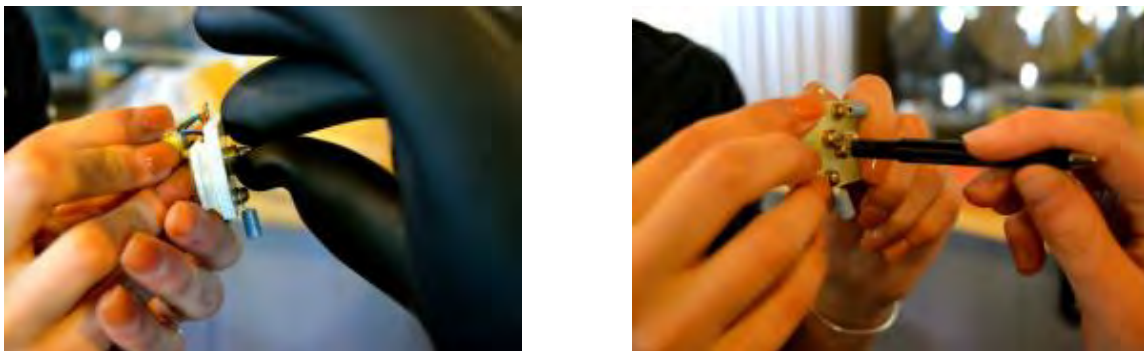


Figure 19. Electrical Safety Tool: current (left) and recommended (right)
(from Nobles, 2014)

4. Event Highlight A: The Internship for Sailors Concept

ATHENA V was the first event where an officer above the rank of Lieutenant participated. CDR Day wished to send a strong message to the crew that she fully supported ATHENA, and in a move that departed from CDR LeBron's philosophy of enabling but not participating, she decided to take to the stage. (CDR Day, May 30, 2014).

Her idea, the internship program for Sailors, addresses a problem that has bothered her for years. The Navy allows senior leaders to attend executive fellowships that give them access to cutting edge knowledge and techniques pervading the business world and academia. However, there are no similar fellowship opportunities available to the enlisted community. CDR Day's solution was to develop an internship program that would enable highly qualified enlisted personnel to also attend similar career-enhancing professional development programs.

CDR Day's enlisted fellowship program was compelling; however, in true ATHENA fashion, an idea presented by one of the most junior enlisted members at ATHENA V won the Admiral Sims Award. CDR Day wasn't surprised to see that the voting members were able remain neutral and vote on the idea instead of the presenter. Additionally, she explains why she chose to spend her time developing an idea that she knew wouldn't win or even get developed:

Nothing is going to happen with my idea. I'm very passionate about it and was happy to present it at ATHENA [V] but it's not going to go anywhere. But, if somebody else gets excited about it then maybe we can start something. You can lead from the bottom up, and the Navy paradigm on internships and fellowships isn't going to change until enough voices from the bottom start bubbling up calling for change. And ATEHNA offers us that voice, which is why I chose to present my idea today. (CDR Day, interview, May 30, 2014)

Currently, there is no plan to develop the internship program for sailors. However, ATHENA continues to be a springboard for deck plate-led innovation even if the ideas aren't immediately picked up and developed. The ability to present an idea to a diverse audience and get the conversation started is critical to future technological innovation. These conversations are often required in order to change innovation-killing attitudes,

and project ATHENA's success in providing Sailors with a platform to voice their desire for change is as important as any 'black box.'

5. Conclusions

ATHENA V was unique for several reasons. It was the first event where a ship Captain participated. It was also the first event where a working prototype of an ATHENA idea was demonstrated. Finally, it was the first time that LT Nobles was able to inform participants that an ATHENA idea (Cosmogator) had received substantial funding and Navy backing. These last two acts demonstrated conclusively that ideas could become reality through the ATHENA platform, and that the industry participants and big Navy overall were not afraid to take a chance on junior Sailors and their ideas for making the Navy better.

As ATHENA V wrapped up, LT Nobles took stock of the day's events. There was good participation from a variety of industry vendors and numerous commands, and for the first time he had been able to show participants how ATHENA ideas were being developed with support from outside agencies. Summer was approaching though, and the *USS Benfold* would soon be leaving her yard period (traditionally a slow operational tempo time in a ship's service cycle) and ramping up operations in preparation for a deployment later in the year.

Would ATHENA survive amidst the extreme pressure of sea trials and a deployment? Would ATHENA continue to spread throughout the Navy without the continued drum beat provided by the *Benfold's* innovators? LT Nobles thought back on ATHENA's beginnings and on the progress made over the past 15 months and was determined to maintain ATHENA's current trajectory. The challenge would be to develop a plan for project ATHENA that would ensure its success regardless of the *Benfold's* whereabouts or operations tempo. *Easier said than done*, he thought as he pulled out of Societe Brewing Co's parking lot and headed for home. (LT Nobles, personal correspondence, July 9, 2014).

M. ATHENA FUTURE

1. Introduction

Throughout early summer 2014, LT Nobles and several members of *Benfold's* ATHENA team met to figure out how to keep project ATHENA's momentum going amidst the specter of upcoming at-sea trials and a deployment. These would be critical months for the future of ATHENA, and through their planning, persistence and some well-timed external support, project ATHENA continued to grow and looked poised to expand even further.

2. ATHENA Pillars

In June 2014, LT Nobles and the *Benfold* innovators developed a future vision and road ahead for project ATHENA. The focus in the upcoming months would be on expansion—to the San Diego waterfront, the greater surface Navy and eventually throughout the DOD. They developed a plan hinging on the following four key pillars, which are outlined on the project ATHENA blog (2014):

1. Establish an Athenian COUNCIL: Currently there is no formalized group of ATHENA participants; however, there is certainly a cadre of ardent supporters. The goal is to form a standing body of supporters who will not only participate in ATHENA events, but as members of the Athenian Council, help spread the word about project ATHENA throughout their commands.

2. Conduct Athena THINK: Project ATHENA will begin to include free workshops and classes that are available to anyone who wishes to attend. These will start with design thinking workshops that will expose participants to the latest design thinking tools and techniques.

3. Host Athena SPEARS: In addition to letting unsolicited ideas emerge from the deck plates, project ATHENA will also start designing solutions to specific problems. ATHENA members will meet to address pressing problems in much the same manner as a firm like IDEO would assist a unit or organization with a specific issue.

4. Conduct Athena FORUMS: Along with classes and workshops, project ATHENA will start hosting guest speaker events. Guests will come from a variety of disciplines and backgrounds and the events will be open to anyone interested in learning about creativity and innovation.

While there are no specific dates currently established for unveiling these new facets of project ATHENA, LT Nobles is confident that some of them will begin implementation before ATHENA VI, which is scheduled for early Fall 2014. While the persistent issues of funding and time (LT Nobles and those helping him do this largely on their own time) still need to be addressed, the future looks bright for project ATHENA if the *Benfold's* innovators can succeed in implementing this aggressive vision.

3. ATHENA East

One indicator of the just how promising project ATHENA's future could be is the ATHENA East event scheduled for September 2014. The idea for hosting an East Coast event was introduced at IDEAFEST, and while the details are still being planned, the event is scheduled to be held at Old Dominion University in Hampton Roads, Virginia.

Numerous East Coast commands, industry partners and private organizations have expressed an interest in the ATHENA East event. Currently, there are a dozen pitches scheduled, and while attendance figures are still unknown, expectations are high that the event will be as large as the West Coast ATHENA events. LT Nobles plans on attending in September, and is optimistic that the event will help project ATHENA establish a permanent foothold on the East Coast (LT Nobles, interview, July 9, 2014).

4. The White House

A final indicator of project ATHENA's potential for wider impact landed on LT Nobles's desk in mid-July. As LT Nobles was hammering out the details of the project ATHENA vision, he received an email from the Public Affairs Officer with an intriguing subject line: "Invitation to the White House." The invitation was from the Deputy Director of Technology and Innovation, which falls under the White House Office of Science and Technology. LT Nobles is not sure how they found out about project

ATHENA, but suspects that one of the technology companies who attended an ATHENA event likely passed them the information.

The Technology and Innovation department was hosting a conference on exploring the military applications of additive manufacturing. Additive manufacturing is the process by which items are produced from materials primarily through the use of 3-Dimensional Printing technology. Key leaders from both the military and the commercial additive manufacturing enterprise would be in attendance. They wanted a representative from project ATHENA to give the panel a brief on ATHENA and to explore the potential application of additive manufacturing at the small unit level (LT Nobles, personal correspondence, July 24, 2014).

LT Nobles jumped at the idea, but the *Benfold* did not have money to fund his travel. LT Nobles worked with CDR Day to solicit funding from higher headquarters, and although the initial request was denied, he eventually succeeded in obtaining sufficient funding to make the trip. After receiving funding, LT Nobles researched additive manufacturing and put together a brief outlining ways in which project ATHENA could utilize additive manufacturing technology (LT Nobles, personal correspondence, July 24, 2014).

On July 21, he finished the brief and boarded a plane for Washington, DC. The next morning LT Nobles headed for the White House Conference Center located just steps away from the White House. As he entered the building he was greeted by a host of event coordinators who quickly ushered him to his seat. LT Nobles looked around the room and quickly noted a slew of General officers along with dozens of suited “DC types” mingling in the corridors.

There were approximately 30 attendees total, and one of them, Vice Admiral Cullom, approached LT Nobles and handed him a business card with his personal email address on the back. Vice Admiral Cullom, who currently serves as the Deputy Chief of Naval Operations for Readiness and Logistics (the N4), told LT Nobles that he was excited to learn about project ATHENA. He also gave LT Nobles an invitation to contact him personally if there was ever anything he could do to help project ATHENA. *Not a*

bad way to start the day, LT Nobles thought to himself as he sat down and began listening to the opening speaker (LT Nobles, personal correspondence, July 24, 2014).

Mr. Thomas Kalil, the Deputy Director for the Technology and Innovation division of the White House Science and Technology branch provided opening comments. As soon as he was finished, each of the attendees cycled to the front of the room and gave a 15 minute brief. LT Nobles then presented his pitch, sensing genuine interest and enthusiasm from the crowd (LT Nobles, personal correspondence, July 24, 2014).

After his brief, several high ranking officers and industry leaders approached him and offered business cards and invites to discuss project ATHENA further. The most notable supporter was Mr. Kalil, who pulled LT Nobles aside after the brief. He expressed great interest in project ATHENA, and LT Nobles remembers him stressing the fact that the administration was interested in furthering innovation efforts like project ATHENA. To that end, he wanted LT Nobles to identify clear ways in which the Administration and the Secretary of Defense could help innovation efforts like project ATHENA grow (LT Nobles, personal correspondence, July 24, 2014).

LT Nobles reflected on the conference as he flew back to San Diego. In just a few short hours, the project ATHENA concept had reached an audience of highly influential politicians, businessmen and military leaders. He now had direct access to most of these individuals who would be very valuable allies in the fight to expand project ATHENA and usher in a culture of creativity in the Navy. “Milicon Valley” was one step closer to becoming reality. As he looked out the window at the Washington, DC skyline, he pulled out a pen and paper and began to list ways that “The Administration and the Secretary of Defense could help project ATHENA grow” (LT Nobles, personal correspondence, July 25, 2014).

N. PROJECT ATHENA: QUANTITATIVE OUTPUTS

Project ATHENA and the culture of innovation it symbolizes are poised to expand throughout the Navy and potentially the entire Defense Department. However, this seemingly limitless future would not have been possible without numerous small

successes along the way. The following is a recap of the key technology-centric ideas pitched at ATHENA events that still have traction today. In addition to these ideas, there were several process-centric ideas such as PartnerShips (ATHENA IV) and *Benfold* University (ATHENA III) that have already been implemented aboard the *Benfold*. However, it is the technology-based ideas that will eventually become the critical outputs that many in the DOD will look for as “proof” that innovation efforts such as ATHENA are worth supporting.

The following technology-based ideas were briefed at ATHENA events and are currently under development (LT Nobles, personal correspondence, July 24, 2014):

1. Name: Environmental Acoustic Recognition System (EARS)

a. Originator: ENS McClenning

b. Idea: The EARS concept is based on an ARMY system that uses acoustic signatures to locate sniper fire and applies that concept to ships trying to identify surface contacts in low visibility.

c. Pitch: Presented at ATHENA II (July 2013)

d. Status:

1. Summer 2013: Prototype developed by the USC-ICT.

2. Sept 2014: The team is soliciting funding to move project into full scale development.

2. Name: Optical Database and Information Network (ODIN)

a. Originators: FC2 Robert VanAllen, FC2 Michael Owen, FC2 Lisa Stamp (*USS Benfold*).

b. Idea: Create a database that helps identify surface contacts by combining information resident in other sensor databases.

c. Pitch: Presented at ATHENA III (October 2013). Admiral Sims Award winner for ATHENA III.

d. Status:

1. Nov 2013 – Current: Team ODIN is working with SPAWAR to further develop and refine the concept. SPAWAR is assisting with soliciting funding from the Office of Naval Research (Technology Solutions department) for prototype

development and testing. Additionally, the team is working with the Aegis Modernization Team to merge previously directed technology upgrades into the ODIN software requirements package.

3. Name: Small Craft Action Team (SCAT) Heads-Up Display (HUD)

a. Originators: FC1 William Steele, FC2 Amanda Curfew, FC2 Justin Langenor, GM3 Jacob Niessen.

b. Idea: Utilize augmented reality headsets to facilitate communication between the bridge and crew served weapons handlers on the weather decks.

c. Pitch: Presented at ATHENA III (October 2013)

d. Status: LT Nobles is working with professors at NPS to identify exact technical requirements. Additionally, the team is soliciting funding to move the project into the prototype development phase.

4. Name: Cosmogator

a. Originator: LT William Hughes (*USS Benfold*).

b. Idea: Use existing technology to automate celestial navigation.

c. Pitch: Presented at ATHENA III (October, 2013)

d. Status:

1. Nov 2013 – Feb 2014: SPAWAR scientists collaborate with LT Hughes to refine the concept.

2. Feb 2014: The NASA AMES Research Center provides a 3-D printed prototype of Cosmogator at ATHENA IV.

3. Apr 2014: The CNO approves up to two million dollars in financial backing for project development and testing.

4. May 2014 – Current: Support provided by the Navy's Navigation department (under N2/N6), SPAWAR and the CRIC. The team is currently researching commercially available technology and software options. Several vendors have been identified and will begin providing demonstrations in October 2014. Eventually, a vendor whose technology best supports the idea will be selected and the project will enter the contract solicitation phase.

5. Name: Maintenance Software Systems Integration

- a. Originator: CT2 Anna Nothnagel (*USS Benfold*).
- b. Idea: Use mobile software applications resident in the aviation community to improve surface ship supply and maintenance operations.
- c. Pitch: Presented at ATHENA IV (February 2014).
- d. Status:
 - 1. Mar 2014 – Apr 2014: A team from Lockheed Martin collaborated with CT2 Nothnagel to develop a tablet prototype.
 - 2. May 2014: Maintenance tablet prototype demonstrated at ATHENA V.
 - 3. Current: CT2 Nothnagel is continuing work with Lockheed Martin to solicit funding for product development and testing.

6. Name: Tankless Water Heaters

- a. Originator: ENS Thomas Baker (*USS Benfold*).
- b. Idea: Make shipboard water heating operations more efficient and cost effective by utilizing tankless water heaters.
- c. Pitch: Presented at ATHENA IV (February, 2014)
- d. Status:
 - 1. March 2014: ENS Baker teams up with SPAWAR scientists to refine the concept and SPAWAR provides a fluke meter to help ENS Baker establish a water-heating energy usage baseline.
 - 2. Current: While funding has yet to be solidified, the team is moving forward with the project. ENS Baker is currently gathering shipboard water heating usage data. Additionally, the team is exploring possible prototype development options with iENCON, a San Diego based company specializing in energy conservation.

7. Name: Electrical Safety Tool

- a. Originator: EM2 Susan Pavao (*USS Benfold*).
- b. Idea: Use a government issued pen instead of expensive and cumbersome equipment to switch out a common light bulb quickly and effectively.
- c. Pitch: Presented at ATHENA V (May 2014)
- d. Status:

1. June 2014: A team of scientists from SPAWAR teamed up with EM2 Pavao and helped her improve and refine her idea. Additionally, they produced a 3D printed prototype of her updated idea.

2. July 2014: LT Nobles presented the idea at the White House Additive Manufacturing Conference as a possible military use case for 3-D printing technology.

O. PROJECT ATHENA: QUALITATIVE OUTPUTS

1. Introduction

Project ATHENA had a profound impact on the crew of the *USS Benfold*. This impact was largely behavioral and is therefore far more difficult to quantify than ATHENA's more tangible outputs discussed in the previous section. Participation in project ATHENA fueled behavioral changes that can be viewed as a type of qualitative output.

However, the entire crew did not support project ATHENA equally, and participation in project ATHENA (which was always voluntary) ended up split along Departmental lines. Certain Departments (such as the Weapons Department) were fully committed to project ATHENA, and other departments (such as the Supply Department) chose not to participate in project ATHENA at all.

2. Culture Shift: "Milicon Valley"

Many of *Benfold's* project ATHENA supporters experienced behavioral changes as a result of participating in ATHENA events. The experience of being able to leave the strict and rigid confines of their daily military environment offered these individuals an opportunity to expand their mental horizons and to look at problems differently. Collectively, these behavioral changes contributed to a broader cultural shift aboard the *Benfold*.

The general belief among the junior enlisted personnel who participated in project ATHENA was that the experience gave them a voice and a sense of empowerment. It empowered them to become more invested in their daily activities and helped them

redefine their roles as enlisted Sailors. ST2 Stevens, who served on the *Benfold* for four years and attended every ATHENA event, felt that project ATHENA:

Has broken a lot of boundaries It has changed the way the enlisted view themselves We've never been a drone ship, but project ATHENA made us feel more free to offer our opinions. It's amazing what you can do when you're suddenly valued for your opinions and are given an opportunity to speak up. (ST2 Stevens, interview, May 1, 2014)

FC2 Wagnar, who was a team member on the SCAT-HUD project and served aboard the *Benfold* for three years, recounts how project ATHENA influenced him:

I never really expected for people like us [junior enlisted] to be able to have a say in our gear. Usually it's more like here's this new thing, go and use it, and no one asked for our input in it. And so I got involved with project ATHENA so that I could have a voice and it wouldn't be the same old thing where some engineer who's never going to use the system force feeds us a product when they have no idea what the end user is going to see We love to complain and it's nice to think that we actually have a chance to change the things that we've been complaining about for years. (FC2 Wagnar, interview, May 2, 2014)

FC2 Van Allen, who served on the *Benfold* for two years and pitched at ATHENA III as a member of team ODIN, believed that:

Project ATHENA was good because it just encouraged people like us [junior enlisted] to think at all. Because the job does not; the job doesn't encourage you to think in the slightest We're taught to follow the card and do exactly what you're supposed to do, and just encouraging people to stop and question at all is a positive thing. Even if you just get incremental improvement from your average deck plate Sailor from time to time, it's worthwhile. And once you get people to start thinking about how they can solve problems, I don't think they stop And that's the beauty of it because it doesn't cost us anything to sit down and think- that's free. (FC2 Van Allen, interview, May 1, 2014)

FC2 Owen, who was also on Team ODIN, explains how participating in project ATHENA helped him develop professionally:

There was a huge shift when commander LeBron took over; it was all about getting people to think outside of the box, to think creatively. And then project ATHENA came along and solidified that belief with an actual venue to do it Before ATHENA came along we were complaining on the smoke deck every day, bitching about things and wishing we could do

something about it. But no one had a venue to voice their problem and figure out a solution. And now with ATHENA we have a platform where people can help us with our problems and we went from a monotonous drone-like outlook to like man, how am I gonna get around this obstacle? And that took time; it had to be pushed because we [junior enlisted] are taught to fix things, and it goes against our natures to try and solve problems. It is so easy to get into the mentality of simply restoring something to its previous condition; to get into the mindset that you're just putting it back the way it was, when all the lights were green. And it's so monotonous, doing the same thing every day, every week. It's like you forget why you're doing it. And now there's a huge difference in the way I think about it; I'm actually solving a problem instead of just trying to get something back the way it was so I don't get yelled at. (FC2 Owen, interview, May 1, 2014)

Many of the *Benfold*'s senior enlisted members supported project ATHENA, and while most did not directly participate in ATHENA events, FCC Roberts did. He served on the *Benfold* for three years and recalls the effect that project ATHENA had on the crew:

One of the things that create the culture is our mindset, and it's different here on the *Benfold*; always has been. We have a tendency to go 'Benfold Big' which is basically an attitude that makes you do something bigger and better than anyone's ever seen before And we don't put things in the too hard pile either. If you say you can't do it or that it's impossible you'll get laughed at around here. So we had a huge amount of potential energy stored up, and project ATHENA gave it a way to go kinetic. ATHENA allowed us to start moving...And one of the biggest side effects of project ATHENA was confidence The guys that participated gained confidence in themselves and in the military. They knew that if they could brief a bunch of PhDs and officers at an ATHENA event that it was no big deal to brief their Chief or the XO. And so the Sailors became more engaged in the command; they had buy-in. They were not afraid to voice their opinions because they knew that people were listening. (FCC Roberts, interview, May 1, 2014)

The junior officers who supported project ATHENA echoed many of these sentiments. They too felt that project ATHENA helped usher in a change in culture that led to a more open, communicative and ultimately innovative unit. LTJG O'Donnell who experienced life on the *Benfold* under four different COs says:

I think the environment has definitely changed from when I got here four years ago. Back then you didn't have a say really in things that were going on. And I think the change really started with CDR LeBron and project ATHENA. After going through all of these ATHENAs and seeing people speak up, and be heard, and get motivated, and innovate, we all, the officers and senior enlisted, realized that this is really making a difference The success has been the mindset change; now I can say something and know that I will be heard... And now it's no longer good enough to just listen to what other people tell you to do just because that's the way we've always done it. Now, we open our eyes and look at something and say hey, does this make sense? Having a proactive mindset and learning everyday have been a huge benefit of this change. (LTJG O'Donnell, interview, May 2, 2014)

LT Hughes, who arrived on the *Benfold* a year before project ATHENA was implemented, felt that it helped Sailors gain confidence and that it taught him to look at problems differently. He recalls:

Project ATHENA definitely changed the way I approach problems. And solutions too. It taught me to look into things to identify problems and not just to bitch about them; to question things and try to make them better Just last month, an idea popped into my head and I ended up pursuing it and writing a blog about it and submitting an article to the Navy Proceedings publication about it. I think back to a year before ATHENA and that would not have been my train of thought on things. (LT Hughes, interview, May 6, 2014)

ENS Baker, who arrived on the *Benfold* just as project ATHENA was being Implemented, was not able to compare its effects to previous command climates. However, he noticed that over the ensuing year the climate aboard the ship slowly changed, and that Sailors had shifted their energy and attention from complaints to solutions. For him, project ATHENA was a positive thing for the crew; "The proof is in the fact that the way we interact daily changed, the nature of our relationships changed. We turned bitching into problem solving" (ENS Baker, interview, May 2, 2014).

ENS McClenning also felt that project ATHENA changed the way the crew interacted. Over the course of his two-year stint on the *Benfold* he recalls:

In general the flow of communication improved aboard *Benfold*. People are more willing to say hey, there's a problem, I can report it. Because it's not that, oh, well, hey, we have a problem, let's make sure none of the

officers find out, because then we're gonna get in trouble because there's a problem. Now it's more like, hey, there's a problem, and here's the solution for it. We've seen a lot more of that recently The barriers come down with ATHENA, and you feel much more free to voice your opinion and do something about a problem. (ENS McClenning, interview, May 1, 2014)

CDR Day, the XO for 18 months and current CO, has witnessed her barometer of success—the “give a shit factor”—increase among the crew as a result of project ATHENA:

Just last week someone was complaining about not being able to get a proper shine in one of their spaces, and a third class was passing by and stepped right in. He was like ok, game on, and on his own time of his own will he spent the next couple of hours shining a workspace that wasn't even his And shortly before that incident we were standing on the quarter deck and we needed a BM [Boatswain's Mate]. BM2 York just happened to be passing by carrying trash across the brow and without anyone asking him, he went and sat his trash down and pulled out his Boatswain's pipe and put himself in position and was ready to go before anybody said a word. You wouldn't get that on a lot of ships; you'd have to direct a Sailor to specifically do that task on a lot of ships. (CDR Day, interview, May 30, 2014)

CDR LeBron was very pleased with project ATHENA's impact on the crew. He attributes the *Benfold's* culture shift to a variety of things, including project ATHENA, and felt that the initiative excelled at improving Sailors' confidence and willingness to think more broadly. He states:

I wouldn't say that the culture shift we saw on the *Benfold* was purely as a result of project ATHENA, although I don't think you can overstate the value of ATHENA. But ATHENA was one dimension of a complete do-over for the way we did business on *Benfold*. But the change was significant and there was one example [of this change] that really had an impact on me. I had one female Sailor who was very, very shy; she had a rough go of it early on I think. And I saw her at one of the ATHENA events actually get up and give a presentation on something that was important to her And there was a big time defense contractor there, Lockheed Martin I think, that keyed in on her idea and helped her develop it. That event, man, that was the culmination of everything we had been doing with ATHENA. We got an industry partner to actually spend their own time and money on developing something that would be good for the fleet at no cost to the government. And, we got a Sailor who was shy and

quiet to break out of her shell and actually have a lasting impact on the organization. She gained a lot of credibility through ATHENA and became kind of a key player on the ship. (CDR LeBron, interview, Jun 17, 2014)

3. Remaining Challenges: Silos of Support

Participation in project ATHENA contributed to a cultural shift aboard the *Benfold* that led to a more innovative command. However, support for project ATHENA was fragmented. Certain departments, like the Weapons Department, overwhelmingly supported it while other departments, like Supply, did not participate in any way. While there was no evidence of outright resistance to project ATHENA, the fact that a significant portion of the ship's crew has never participated in an ATHENA event offers an area for potential improvement.

LT Cloepping, the ship's supply officer, chose not to personally participate in project ATHENA and has never had one of his Sailors request to pitch an idea at an ATHENA event. His feeling was that the Supply community in general doesn't deal with the rapidly developing technologies that seemed to be the mainstay of project ATHENA. Additionally, he attributed the lack of participation to a cultural difference between the support ratings and the warfare ratings:

I thought project ATHENA was a great idea and I offered it to our guys, but none of my guys did it. I attended many of the events but never participated myself either I'm not sure why we haven't participated. We're support guys and maybe we are just a little bit drier compared to some of those folks that are working in combat systems. They're a little bit more innovative, and we're like the accountants, so a little bit drier. We look at numbers all day long, not Tomahawk missiles, and so maybe we're just not as innovative as those guys. Our personalities are a little different And we're not down there working with all these high-tech pieces of equipment; we're pulling repair parts and cooking food. (LT Cloepping, interview, May 29, 2014)

Chief Hospital Corpsman (HMC) Contreras, the ship's Independent Duty Corpsman, echoed LT Cloepping's belief that participation was largely dictated by the roles and duties that people had on the ship. He felt that project ATHENA was geared more towards the surface warfare ratings that dealt with cutting edge technology and

weapons systems. He clearly understood that it was an open forum for all crewmembers, and says that he never felt alienated or unwelcome to participate in project ATHENA. However, he recalls:

I looked at ATHENA and thought it was a good idea but I kind of felt like hey, what impact does it have in our world down here in Medical or in other ratings that support, you know, the sea warrior in general? ... I just felt they were more interested in developing some new technology for the warfighter not a better way to serve food or administer flu shots. It just seemed like more of a surface warfare deal. (HMC Contreras, interview, May 29, 2014)

LT Nobles also recognized that there were silos of support for project ATHENA that fell along departmental lines. When asked why he thought these pockets of support developed, he replied:

There's a school of thought that says that because the combat systems guys are around all of these whiz-bang gadgets all the time that maybe we sort of think more technically. Some might say it's my influence because I went from Weapons Department to Combat Systems Department and am more involved with those guys than say the Supply guys. As for me, I honestly don't know. (LT Nobles, interview, May 30, 2014)

The challenge for overcoming the silos of support problem is to try to improve participation from the support departments without having to make it mandatory. LT Nobles explains the quandary:

We want those guys to play, but that's what we try to avoid with project ATHENA, is making it feel like it's directed. If you don't want to play that's fine. We don't force anybody because the minute people feel like they have to participate and produce some kind of deliverable we lose it. (LT Nobles, interview, May 30, 2014)

4. Conclusion

The cultural shift that project ATHENA helped bring about on the *Benfold* fueled participation that, like a democracy, is essential for innovation. Thus, these behavioral changes were both a product of project ATHENA and a requirement for the project's continued survival. While participation in project ATHENA still remains segmented largely along departmental lines, the impact of project ATHENA on the majority of the crew has been profound. A similar macro level cultural shift to a "Milicon Valley"

mindset may well be necessary if the DOD is going to successfully improve tactical level technological innovation.

P. CONCLUSION

ATHENA projects such as ODIN, Cosmogator and EARS represent the true spirit of project ATHENA. They were conceived by junior leaders operating at the tactical level, who wanted to make their lives and the Navy better. These ideas were presented voluntarily at ATHENA events where like-minded people from other commands, academia, and industry voluntarily gathered to hear them, and where possible, to help them bring those ideas to fruition.

With no funding, no official command sponsorship or official support (outside of *USS Benfold*), a group of young enlisted Sailors and junior officers embarked on a journey to change the culture of their ship and create innovative solutions to their problems. In just 15 months, CDR LeBron's vision of getting his JOs to think outside of the constraints of doctrine had morphed into a project that was poised to change the culture of the Navy and send shock waves throughout the DOD. Due in large part to the efforts of LT Nobles and the team of innovators aboard the *USS Benfold*, project ATHENA continues to grow, ushering in a new era of creativity and innovation at the tactical unit level. While the tectonic shift from procedural compliance to "Milicon Valley" involves an enormous cultural change that will take years to materialize, innovators at the deck plate level can take solace in knowing that change is on the way.

In late July 2014, LT Nobles sat down at his desk aboard the *USS Benfold*, fired up his laptop, and began working on his deliverables for the White House Office of Science and Technology. As he started typing he paused for a moment and stared at the screen. He thought back to the day, just 15 short months ago, when he had sat down at the very same desk and on the very same laptop had hammered out his "wiki wardroom" brief. He never imagined that the journey he started that day would eventually touch the lives of hundreds of Sailors and citizens, help usher in a new culture of creativity and innovation aboard *Benfold*, give birth to projects with millions of dollars in funding, and eventually lead him to the CNO's desk and ultimately to the steps of the White House.

He puzzled over how it all happened. Command support from CDR LeBron and CDR Day were critical, and having a group of courageous innovators concentrated on the *USS Benfold* certainly gave project ATHENA the support it needed to stay alive. There was of course the support of outside agencies too, like the USC-ICT, the CRIC, and dedicated people like Josh Kvavle and his team of entrepreneurial scientists at SPAWAR. But, there was something else, something intangible that he just couldn't put his finger on. As he looked up from the computer his eye zeroed in on a picture hanging above the desk. He had often looked to that picture for inspiration, and as he gazed at its worn edges the answer came to him — he and the entire project ATHENA team had not been alone on their journey. Breathing a sigh of relief, and offering an appreciative nod to the picture (see Figure 20), LT Nobles went to work preparing for the next phase of project ATHENA.

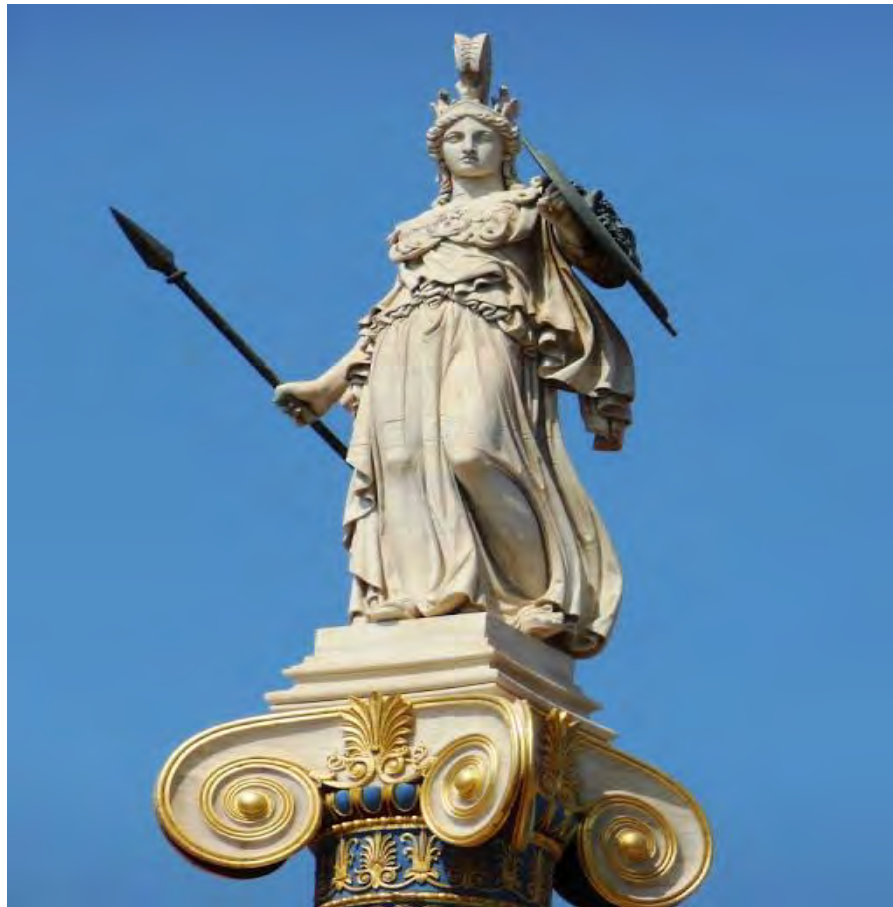


Figure 20. The Goddess ATHENA (from Nobles, 2014)

THIS PAGE INTENTIONALLY LEFT BLANK

IV. ANALYSIS OF FINDINGS

A. INTRODUCTION

In this chapter, project ATHENA will be analyzed through the optics of organizational change management and design thinking. First, the events, interactions and outputs that occurred during the 15-month project will be viewed against the backdrop of both historical and contemporary change theory. Then, the analysis will shift to identifying ways in which project ATHENA supports historical and contemporary design thinking methodologies. Finally, the analysis will identify ways in which the process of innovation pioneered in project ATHENA can be applied to other DOD organizations seeking to improve tactical level technological innovation.

B. ORGANIZATIONAL CHANGE MANAGEMENT

Implementing project ATHENA aboard the *USS Benfold* and expanding the innovation effort out to the public and private sector required cultural changes, risk and adjustment to the status quo—all of these are hallmarks of organizational change. Furthermore, since these events unfolded within a DOD context, the case offers unique insight into the change management considerations that can lead to success in future tactical level technological innovation efforts.

For the purposes of this analysis, the organizational change enabled by project ATHENA was the *USS Benfold's* transition from a tactical level unit with no innovation process to one with a clearly defined method for technological innovation. Specifically, the focus will be on the way in which an innovation platform was emplaced aboard the *USS Benfold* that enabled the crew to harness the intellectual and monetary resources of external agencies to identify and develop technology with Navy-wide application.

1. Kotter's Change Process

Project ATHENA progressed in a manner that largely supported Kotter's eight-step change model. While the project didn't utilize every step, it confirmed that many of

Kotter's recommendations can lead to successful tactical level organizational change in the following ways:

Step 1. Establish a Sense of Urgency: This is one of the areas where project ATHENA did not support Kotter's theory. Urgency was never emphasized during project ATHENA; rather, the initiative morphed into its current form over several months. Additionally, CDR LeBron never forced the issue or stressed that project ATHENA had to meet established timelines etc.. Thus, project ATHENA gradually grew and expanded based off a slower, more evenly paced implementation timeline.

Step 2. Create a Guiding Coalition: CDR LeBron realized that he could not singlehandedly force the JOs to become intellectually curious or innovate, so he relied upon his staff to execute his vision. LT Nobles was the critical enabler; however, LT Nobles was supported by the majority of the *Benfold's* JOs and a small group of enlisted Sailors. Together, this team formed project ATHENA's foundational core, and its members were able to garner support by convincing individuals and organizations to support project ATHENA.

Step 3. Develop a Vision and Strategy: CDR Lebron clearly articulated his vision for creating an entrepreneurial unit on his first day in command, but he did not articulate a defined strategy for executing this vision. However, not defining the strategy was part of CDR LeBron's vision — he gave the team of innovators on the *Benfold* an opportunity to develop a winning strategy based on the resources available. Thus, the success of the effort relied upon CDR LeBron's vision and his willingness to let the strategy emerge directly from the environment.

Step 4. Communicate the Change Vision: CDR Lebron and LT Nobles excelled in getting the word out both internally and externally. They constantly reinforced the message at group gatherings and formations, and LT Nobles spearheaded the social media campaign (ATHENA blog, Twitter feed, and Facebook page), which helped spread the message about ATHENA to the crew and outside agencies. Additionally, CDR LeBron directly supported each ATHENA event along with ancillary innovation events, and LT Nobles was a consistent presenter at ATEHNA events. These actions augmented

their verbal and written support for the initiative, which was critical to generating and maintaining momentum.

Step 5. Empower Broad-Based Action: CDR Lebron was critical in this aspect of the change process. He fostered a command climate that encouraged risk-taking and gave his staff (particularly LT Nobles) enormous leeway in developing and executing project ATHENA. CDR LeBron also ensured that even the most junior Sailors in the command had an equal voice in developing and refining project ATHENA.

Step 6. Generate Short-Term Wins: LT Nobles went to great lengths to publicize and celebrate each project ATHENA success. He ensured support agencies followed through on their commitments to support projects, published project status to social media and ensured that ATHENA participants were aware of each project's status. These "small wins" helped to maintain momentum and kept support and morale high throughout ATHENA's 15-month lifespan.

Step 7. Consolidate Gains and Produce More Change: CDR LeBron and LT Nobles were keen to identify and exploit avenues that enabled project ATHENA to grow. They continually sought out venues to spread the word (for example the AFCEA conference, the SNA symposium etc.) and they explored external support options with government agencies (CRIC) and the private sector. Collectively, these small actions served to expand ATHENA's support base and were critical in maintaining forward progress.

Step 8. Anchor New Approaches in the Culture: Project ATHENA is currently in this stage of the change process. ATHENA events are still occurring on a quarterly basis, and the culture of innovation is very much alive onboard the USS BENOFD. However, the ship is entering a phase of high operational tempo and to date there are still no tangible ATHENA outputs (i.e. 'black boxes'). While ideas such as the Cosmogator have financial backing and are entering the procurement cycle, it is unlikely that there will be any ATHENA technologies delivered to the Navy in the near future. This represents a problem since this lack of tangible output could dissuade the crew and lead to a falloff in participation and support; particularly if operations tempo is high. LT Nobles is highly

aware of this issue and is pressing support agencies to speed up development of previous ATHENA initiatives; additionally, he is looking for ways to rapidly prototype recent ATHENA ideas such as the Electrical Safety Tool presented at ATHENA V.

2. Pace and Linearity of Change

Project ATHENA refuted contemporary change theory perspectives on the pace of change, but supported contemporary change theory perspectives on the linearity of change in the following ways:

1. **Pace:** Traditional change theory indicates that organizational changes implemented quickly are more successful than those that are introduced slowly.

The findings from this study do not support that notion; instead, they support contemporary change theory as advocated by Amis et al. (2004). Contemporary theory states that a slower pace of change allows for inconspicuous growth without creating the open hostility and resistance that frequently kill rapid change.

Project ATHENA was implemented at a slow and steady pace over the course of many months. There were never hard deadlines or scheduled implementation timelines, nor were there changes to the pace — the events were always envisioned as quarterly and remain so to this day. Thus, the initiative's success largely stemmed from the fact that it wasn't designed as a frequently recurring event (i.e., monthly or bi-monthly).

The quarterly timeline also gave the crew time to adjust to the new initiative, a factor that increased voluntary participation. The four-month gap between events also allowed participants ample time to identify truly relevant needs, research support options, develop and test solutions, and prepare compelling pitches. It also allowed support agencies such as SPAWAR and the USC-ICT time to develop and prototype ATHENA concepts, and for these concepts to reach Navy commands (via the CRIC) that were capable of providing funding.

If project ATHENA events had been spaced closer together, it's likely the crew would not have supported them as much (a form of resistance). Participation requires a significant amount of time and effort, and monthly or bi-monthly events would have increased participant work load and decreased voluntary participation significantly. A

shorter timeline probably would have diminished external support as well — agencies such as SPAWAR have limited resources and committing them to monthly events could have increased resistance within these organizations.

2. Linearity: Traditional change theory indicates that successful change is smoothly absorbed into the organization in a linear manner, and the findings from this research support that view.

Project ATHENA gradually grew over a period of many months and the original process was continually refined in order to make it more effective and efficient. These slow and steady process improvements, along with the decision to maintain a quarterly event schedule, helped keep the idea fresh while minimizing the disruptions and pain associated with adjusting the status quo.

The voluntary nature of the project necessitated that it be introduced in the least disruptive manner possible. If it had been forced on the crew abruptly, it is likely they would have resisted and withdrawn their support. This would have killed the initiative from the start — the adoption graph would have shown a line that increased slightly at the beginning of the project and then declined significantly thereafter. However, ATHENA's smooth implementation timeline allowed the crew time to adjust to the change and to see the attention and support project ATHENA was gaining from internal and external agencies. This served to increase interest, which led to a gradual increase in support. Thus, project ATHENA's actual adoption graph continues to be linear (see Figure 21): it slopes gradually upwards at a constant rate as more and more internal and external supporters choose to participate.

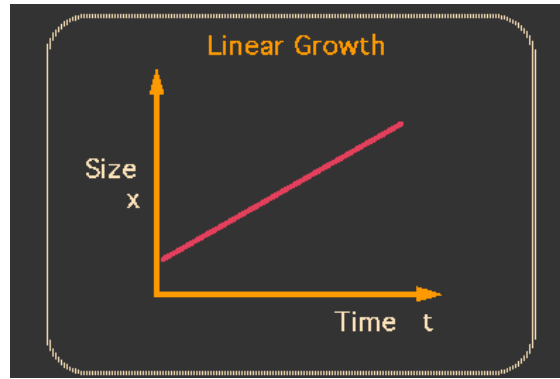


Figure 21. Linear growth graph (from <http://maths.mq.edu.au/texdev/MathSymp/Tuck/node2.html>)

3. The Leader's Role in Organizational Transformation

Project ATHENA supports contemporary change theory with regards to the way in which leaders enable small changes to culminate into radical organizational transformation.

Plowman et al. (2007) found that the traditional view of the leader as an omniscient individual single-handedly executing their vision of change was incomplete. They posited that the leader should focus on interpreting the situation and environment in addition to their traditional role of directing. By acting as a “sense-giver” the leader can interpret the deeper meanings of complex events that enable small changes to coalesce into larger and more radical organizational changes.

CDR LeBron's actions as a “sense-maker” throughout project ATHENA support the contemporary view of Plowman et al. (2007). CDR LeBron understood what he wanted his crew to do — become more creative and entrepreneurial — but he did not dictate the manner in which that would happen. This decision represented a break from the norms of military bureaucracy. Generally, military leaders take the traditional approach to implementing change: they develop the vision, dictate the solution and supervise the execution of that solution through strict procedural control.

CDR LeBron took a more contemporary approach and enabled LT Nobles and the core team of ATHENA supporters to develop the situation based off the opportunities presented by the environment. Furthermore, CDR LeBron was well attuned to the environment and was able to interpret how small adjustments could have large impacts

on the growth of project ATHENA. Because of this “sense-giving” ability, the ATHENA team was able to incorporate minor adjustments that eventually compounded and led to the rapid acceleration of project ATHENA from a simple wardroom exercise in creativity to an innovation phenomenon with large-scale external support.

4. Change and Embeddedness

Traditional change theory indicates that actor embeddedness is an inhibitor to change; therefore, successful change requires external factors (ideas, leaders, etc.) to effect organizational change. Observations during project ATHENA do not corroborate this viewpoint. The findings from this research support the contemporary view of embeddedness first posited by Reay et al. in 2006, which states that actor embeddedness can actually facilitate change through the following three main microprocesses:

1. **Cultivating and Endorsing Opportunities for Change:** CDR LeBron and LT Nobles actively promoted the benefits of project ATHENA and ensured that successes were well publicized via social media and throughout the *Benfold*. Additionally, both were keenly aware of how important it was to obtain maximum exposure for the initiative. Thus, they collectively promoted ATHENA at the AFCEA conference, NSA symposium etc., and solicited opportunities to spread the word via the CRIC and other mechanisms. Collectively, these actions helped to increase visibility, which in turn increased support among the crew and external agencies.
2. **Fitting the New Role into the Prevailing System:** LT Nobles and CDR LeBron understood the importance that project ATHENA would play in fostering a command climate of innovation, and thus sought to incorporate the initiative into the ship’s routine. By formalizing preparatory events such as the day off to brainstorm, and by hosting quarterly events and publishing them as part of the ship’s schedule, the two ensured that the new program became a fixture in the daily routine. This helped fit the ‘new’ initiative into the ‘old’ routine, which facilitated its adoption by the crew.
3. **Proving the Value of the Change:** Another key area where CDR LeBron and LT Nobles focused their attention was in demonstrating the value that ATHENA created for the *Benfold* and the greater surface Navy. CDR LeBron defined value in terms of his vision of ATHENA as a catalyst for promoting an entrepreneurial mindset and for producing tangible outputs. Therefore, he concentrated on gaining exposure and support for projects; additionally, CDR LeBron worked at identifying and supporting projects

that could be produced locally, thereby avoiding the slow and cumbersome acquisition process. LT Nobles defined value in terms of the product; therefore, he also focused on harnessing the resources (intellectual and monetary) of external agencies to convert the ideas promoted at ATHENA into working technologies.

While there are still no ATHENA ‘black boxes’ available to the fleet, projects such as Cosmogator and ODIN are in the acquisition pipeline and are well on their way to being fielded. In addition, the support and buzz that project ATHENA has garnered over the past 15 months has proved to an ever expanding body of ATHENA supporters just how important the initiative is to the Navy.

5. Change Management Applications within the DOD

Project ATHENA illuminates several change management principles that leaders could consider when introducing tactical level technological innovation initiatives. While the majority of the lessons learned from project ATHENA are relevant only within the confines of this case, there are four findings that are generalizable to future DOD innovation initiatives.

The first generalizable finding is that Kotter’s eight-step model for change can be relevant to tactical level organizational change within the DOD. Key concepts such as developing and empowering a core team of supporters, identifying and communicating a clear and attainable vision, capitalizing on small wins and anchoring the change in the “as-is” culture of the organization are all critical aspects of successful change. However, successful change can be achieved without creating a sense of urgency — which is one of the central tenets of Kotter’s method. Leaders can enable change to occur slowly by articulating a vision (the what), empowering their staffs to develop an emergent strategy over time for achieving that vision (the how) and by creating an environment that is conducive to innovation (one that tolerates mistakes and rewards risks).

The second generalizable finding from this case is that change can occur slowly and linearly— it does not have to be rapid or implemented in a series of “fits and starts” to be successful. Project ATHENA offers a good example of change that was slowly implemented over a 15-month period in a smooth and steady fashion. The quarterly event

schedule and successive updates gradually improved the overall initiative and led to a more linear and solid adoption profile.

The third finding is that the leader should focus on making meaning out of the situation, in addition to assuming the traditional directive role. While developing a vision and articulating a strategy are still key components to a successful change initiative, the leader should also focus on interpreting events and helping the staff to formulate meaning from environmental dynamics. By doing this, the leader will help the organization to understand and assimilate the changes at a more deeply rooted level, thereby improving the chances that the change ‘sticks.’

The final generalizable finding from this case is that leaders should capitalize on their embeddedness when attempting to create organizational change. They can do this by identifying or creating opportunities to achieve small victories and by publicly celebrating those victories. They can also use their position within the organization to highlight the need for change—by using their unique perspective, leaders can provide highly relevant examples of why the change is needed, thereby increasing dissatisfaction with the status quo. Additionally, leaders can exploit their embeddedness to find compelling ways to fit the new change into the prevailing system. By making the “new” way of business the “old” way of business, leaders can redefine the status quo, thereby reducing resistance. Finally, leaders can use their embeddedness to gain tacit organizational knowledge that enables them to identify compelling ways to prove the value of the change. Leaders who can clearly demonstrate the change’s positive impact on high-leverage areas within the organization greatly increase the likelihood that the change is adopted and anchored in the new organizational mindset.

C. DESIGN THINKING

The *USS Benfold’s* innovation program offers a unique opportunity to understand the ways in which design thinking can be utilized within the DOD to improve tactical level technological innovation. While the individuals involved with project ATHENA never claimed to use a specific design thinking approach when developing the project, there were many design thinking principles applied throughout the endeavor.

This portion of the analysis will focus on ways in which the tenets of design thinking as espoused by Simon, Martin and Kelly were utilized to transform CDR LeBron's vision into project ATHENA. Recommendations will also be provided detailing ways in which design thinking principles utilized aboard the *USS Benfold* could be used by other tactical level commanders seeking to innovate.

1. Problem Framing

Herbert Simon believed that the solution to a problem was contained in the way it was framed. The customary approach to problem solving is to reduce the options (close the problem space) and choose a solution from within this smaller, more manageable domain. However, limiting the problem space also limits the potential solution space, which often results in subpar solutions. To avoid this trap, Simon felt that leaders should use the design thinking mindset to frame the problem in a way that enables the best possible solution to emerge; to see what "might be" instead of simply what "is" (Boland & Collopy, 2004).

CDR LeBron's actions throughout project ATHENA clearly demonstrate this type of design thinking approach to problem solving. CDR LeBron's primary goal was to induce the JOs to think more strategically — to expand their mental horizons. Rather than closing the problem space by giving his staff a ten-point plan with clearly defined timelines and milestones for achieving this vision, he left it open by simply stating that he wanted his JOs to operate in an entrepreneurial environment. He also gave them an idea of what this environment could look like by exposing them to highly creative companies in Silicon Valley and by providing the crew with time and resources to pursue their intellectual interests.

These actions helped the JOs understand what life aboard an entrepreneurial ship might look like. This galvanizing vision successfully harnessed their collective intellectual capital as they worked together to find a way to create a culture of creativity and innovation aboard the *Benfold*. Thus, by avoiding the top-down prescriptive approach taken by many commanders, CDR LeBron utilized a key design thinking tenet —

problem framing — to enable an optimal solution (project ATHENA) to emerge from the bottom up.

2. Efficiency vs. Innovation: The Knowledge Funnel

Martin (2009) illustrated how companies tend to resolve the tension between efficiency (‘exploitation of routines’) and innovation (‘exploration of alternatives’) by focusing on one at the expense of the other. The DOD has largely favored an exploitation of routines approach by seeking efficiency, predictability and repeatability in its processes and activities. An obsession with procedural compliance, Lean Six Sigma, standard operating procedures etc., has enabled the military to execute incredibly complex tasks in a relatively safe and efficient manner. However, this focus on efficiency has come at a price: the DOD has outsourced its innovation potential to commercial industry because it lacks a well-defined mechanism to develop cutting edge technology from within.

Project ATHENA offers DOD leaders an alternative to this “either-or” scenario. It’s an example of a business model that provides an efficiency-oriented organization like the *USS Benfold* with a means to innovate. One of the reasons this business model succeeded aboard the *Benfold* is because it progressed through Martin’s three-stage knowledge funnel. It started with an exploration of a mystery (how to get the JOs to think strategically), progressed to development of a heuristic (create a questioning and innovative environment) and concluded with codification of a process (project ATHENA).

The ‘mystery’ that initiated the process was CDR LeBron’s desire to create an entrepreneurial environment aboard the *Benfold*. His focus was to get the JOs to expand their mental horizons and think more strategically. He was well aware of the organizational changes and cultural shifts required to accomplish this task. He was also conscious of the need to stay true to the operational tenets of the Navy — they could not stray from the foundational military mindset of chain-of-command and instant obedience to orders. Thus, the mystery that he, LT Nobles and the JOs explored was how to create a questioning culture and drive innovation at the tactical level while remaining within the boundaries of the Navy’s ‘exploitation of routines’ environment.

As the JOs developed a deeper understanding of the problem, they began to look outside the confines of the military for examples of other organizations that successfully created cultures of creativity. They benchmarked with companies such as Apple, Google and Atlassian and began to narrow in on potential ways to stimulate creativity and innovation aboard the *Benfold*. They quickly realized that innovative companies in the business sector face different challenges than DOD units—however, there were some ways that commercial companies fostered creativity that were applicable within the military.

One technique used by commercial enterprises to create cultures of creativity was by giving employees time and resources to research things that interested them. This critical insight enabled LT Nobles to formulate a rudimentary heuristic (stage 2 of Martin’s knowledge funnel). LT Nobles realized that a good way to get the crew to shed the creativity-killing environment of a military unit was to create a separate environment where the crew could think and act entrepreneurially. Giving the crew time off to brainstorm, and providing them with a casual forum off ship where they could discuss ideas out of uniform as equals were critical elements of this heuristic. Thus, by adapting methods employed in the civilian sector to the unique requirements of the military, LT Nobles developed a heuristic which helped illuminate potential solutions to the mystery of creating an entrepreneurial culture aboard the *USS Benfold*.

The final stage of Martin’s knowledge funnel is: reducing the solution to a step-by-step procedure. LT Nobles led the crew of the *USS Benfold* through this stage of the process by improving upon ‘wiki wardroom.’ Over the course of many months, LT Nobles refined the heuristic and distilled it into a repeatable process — project ATHENA. This process for fostering creativity and sparking innovation consisted of three specific steps. First, participants were given time off to identify problems, form teams (if necessary), brainstorm solutions and prototype ideas. Next, participants were given an opportunity to pitch their idea to like-minded innovators and organizations with the resources to support concept development. The pitches were tightly scripted (five minutes maximum with a few minutes for questions) and at the end all attendees voted on

the idea's quality and feasibility. Finally, this process was repeated quarterly, which allowed participants ample time to develop previous concepts and generate new ideas.

3. Strategies for Navigating Innovation Spaces

Tim Brown (2009) described innovation as a process composed of three overlapping spaces: inspiration, ideation and implementation. Inspiration is the problem framed as an opportunity; ideation is the process of discovering and refining potential solutions; and implementation is the process by which the best solution is converted into reality. Organizations seeking to innovate need to navigate these three spaces by employing the following five strategies: find the right people, create a culture of innovation, identify true requirements, use convergent and divergent thinking to develop potential solutions, and prototype these concepts to identify the best solution (Brown, 2009).

Project ATHENA was developed in a manner that highlighted Brown's innovation process triad. The inspiration (or 'mystery' in Martin's model) was how to create a culture of creativity aboard the *USS Benfold* while maintaining strict discipline and procedural compliance. The ideation process (development of a heuristic in Martin's model) occurred when LT Nobles executed "wiki wardroom" and then refined the process by setting time limits and instituting peer voting. The implementation phase occurred once project ATHENA's schema was finalized and the events began to take place quarterly.

Project ATHENA's developers also employed Brown's five strategies for innovation when developing the innovation initiative. First, CDR LeBron found the right person to lead *USS Benfold's* ATHENA team. LT Nobles is a classic "T" personality who has innovation skills vertically, but also has the ability to collaborate across disciplines (cross the "T"). Additionally, LT Nobles used his knowledge of the crew and connections with the CRIC to recruit internal and external supporters. He then formed this cadre of participants into a cross functional team that would eventually become the ATHENIAN Council.

Second, CDR LeBron himself was pivotal in creating a culture of innovation and creativity aboard the *USS Benfold*. By using methods described in the previous section on organizational change, CDR LeBron fostered an environment that tolerated mistakes, encouraged risk and emphasized intellectual curiosity.

Third, project ATHENA was designed specifically to address true requirements. Innovation firms like IDEO must use immersion and empathy to understand their clients' true needs. However, there is no middle man in project ATHENA since the Sailors themselves are both the clients and the innovators. By enabling the Sailors to identify *and* solve their most pressing problems, project ATHENA avoided the problem of "misunderstood requirements," which plagues other innovation efforts that rely on an external innovation agent.

Fourth, divergent and convergent thinking were used extensively in the design of project ATHENA. LT Nobles and the other JOs used divergent thinking in the form of brainstorming sessions and other collaborative efforts to explore possibilities for improving innovation aboard the *Benfold*. These activities produced numerous ideas that were then winnowed down during the convergent phase of the process, resulting in the decision to conduct the first "wiki wardroom" event. The participants then reverted to divergent thinking to identify improvements to 'wiki wardroom.' The best ideas were then down-selected during another convergent phase of the design process, which resulted in the birth of project ATHENA.

Finally, Brown's fifth innovation strategy—prototyping—was used early in project ATHENA's development. LT Nobles had a basic idea of what was going to happen when he held the first "wiki wardroom" event, but he had real idea of exactly how it would unfold or if the concept would work at all. However, once the event concluded, LT Nobles and the JOs knew that the concept was valid and that improvements such as establishing time limits and instituting peer voting were needed. Thus, "wiki wardroom" was a prototype that satisfied many prototype objectives: it gave participants a better understanding of the problem, confirmed the concept's feasibility, and provided immediate feedback on areas for improvement.

4. Design Thinking Applications Within the DOD

The findings from this case suggest that the design thinking principles developed by Simon, Martin and Brown are broadly applicable within the DOD. Specifically, Simons' idea of problem framing, Martin's concept of the knowledge funnel, and Brown's innovation strategies could be employed by DOD leaders seeking to improve tactical level technological innovation.

The first design thinking principle with potential DOD application is Simon's concept of problem framing. Leaders should focus on interpreting the problem of technological innovation in a way that envisions what "might be." This leaves the problem space open, thereby expanding the range of possible solutions. Furthermore, leaders should leave this problem space open longer to create a greater window of opportunity for the optimal solution to emerge. Eventually, the leader will need to shift to more traditional problem framing methodologies such as developing a plan of action and setting target dates; however, this transition should be delayed for as long as possible.

The second generalizable design thinking approach from this case is Roger Martin's concept of the knowledge funnel. Leaders could utilize this three-step approach to guide them in the development of their own technological innovation platforms. First, leaders would focus on identifying the true mystery they wish to explore — clearly defining and articulating the problem is a critical first step in design. Second, the leader could empower the staff to distill the problem into a set of generalizable observations or rules of thumb (i.e., a heuristic) that could help the staff better understand the problem and identify solutions. Finally, the staff would develop a detailed procedure for solving the mystery, which could then be codified and made repeatable. This would ensure that the process could be executed despite the rapid personnel turnover common in military units.

Finally, Tim Brown's strategies for navigating innovation spaces could benefit future DOD innovation efforts. To improve tactical level technological innovation, leaders should initially focus on assembling the right cross-functional teams. These teams should be populated with "T" individuals who possess both vertical (deep) and wide

(broad) skills and interests. Second, leaders should utilize change management techniques to cultivate cultures of creativity that promote intellectual curiosity and risk taking. Next, leaders could focus innovation efforts on only high-impact problems by ensuring requirements and solutions are addressed by the same entity. Merging the user and the developer eliminates the issue of problem-identification, which often plagues external innovation agents. Then, leaders could guide staffs through the divergent and emergent thinking processes by encouraging brainstorming and idea generation (diverge) and then providing timely decisions during the convergent phase of the process. Finally, leaders could ensure that limited resources were used efficiently by stressing prototyping as a way to quickly understand the problem, identify viable solutions and gain feedback on necessary improvements.

5. Conclusions

In this chapter, project ATHENA was analyzed through the optics of organizational change management and design thinking. The analysis focused on ways in which key principles from each of these disciplines were applied throughout the development of the *USS Benfold's* innovation initiative. Emphasis was placed on principles and frameworks, which aided in the successful development and implementation of project ATHENA. Additionally, recommendations were provided that outlined ways in which these change management and design thinking models could be applied in future tactical level technological innovation initiatives.

V. CONCLUSION

A. CONCLUSIONS

This case study provides leaders with an example of a successful technological innovation effort that occurred within a DOD-specific context. The focus of this research has been on identifying ways in which project ATHENA enabled the crew of the *USS Benfold* to harness their collective intellectual capital and leverage the resources of external support agencies to develop innovative technological solutions to their most pressing challenges. By analyzing project ATHENA through the twin frameworks of organizational change management and design thinking, this researcher attempted to glean generalizable principles and approaches that could be used to improve future tactical level technological innovations efforts.

Project ATHENA provides insights into the unique cultural challenges that tactical level units face when attempting to improve technological innovation. Overcoming generations-old ingrained cultural norms that stress procedural compliance, risk-avoidance and an unquestioning obedience to orders is necessary when commanders seek to cultivate a command climate that emphasizes intellectual curiosity, risk-taking, and a questioning attitude. Conducting this cultural shift while remaining within the bounds of the military's machine bureaucracy, and its exploitation of routines mindset, adds an additional layer of complexity to this formidable change management task.

CDR LeBron, LT Nobles and the crew of the *USS Benfold* accomplished this cultural transformation by following many of the principles outlined in classical and contemporary change management theory. Their actions provide DOD leaders with a compelling example of the way in which an innovation program like project ATHENA can aid in this cultural transition. By establishing a clear vision and enabling the crew to develop the solution, CDR LeBron avoided generating the resistance that often kills change programs executed with a directive approach. Furthermore, CDR LeBron ensured that the right leader was appointed and given the autonomy to develop the program. Thus, LT Nobles was able to use his engaging personality, deep knowledge of innovation, and connections to external support agencies to ensure that the nascent project gained and

maintained the momentum necessary to overcome the organizational inertia that also tends to kill change efforts. Together, these actions served to galvanize support internally and externally which led to project ATHENA's rapid growth throughout the *USS Benfold*, the Navy and the commercial sector.

Project ATHENA also provides insights into the unique design challenges that tactical level units face when attempting to improve technological innovation. Currently the DOD outsources its innovation to external agencies because there is no internal innovation mechanism resident within the military. Thus, tactical level units seeking to innovate have little institutional knowledge available to aid them in designing and implementing innovation programs.

CDR LeBron, LT Nobles and the core group of early ATHENA adopters (the ATHENIAN Council) looked outside the military to help them accomplish this task. They adopted a design thinking mindset and used design thinking problem-solving techniques to zero in on the true requirement and develop an optimal solution. Their approaches to problem framing and use of design thinking methodologies in developing project ATHENA offer DOD leaders a compelling counterpoint to the traditional military approach to problem solving which stresses efficiency and top-down direction. The innovators aboard the *USS Benfold* focused instead on leaving the problem space open for as long as possible in order to truly understand the requirement and on creating an environment where the optimal solution could emerge from the bottom up.

The actions of CDR LeBron, LT Nobles and the crew of the *USS Benfold* in designing and implementing project ATHENA demonstrate an innovative approach to innovation. The way in which they employed change management principles and adopted a design thinking approach when developing project ATHENA offer those interested in innovation a glimpse of what tactical level innovation could look like for the DOD in the 21st century.

B. RECOMMENDATIONS FOR FURTHER RESEARCH

While this researcher's inquiry into project ATHENA is ending, the project itself continues to grow. Project ATHENA remains active aboard the *USS Benfold* and the next

event is scheduled for late 2014. Additionally, the ATHENA East will happen in late 2014 and is likely to increase ATHENA's presence on the East Coast and throughout the Navy. These events represent opportunities for other researchers to study tactical level technological innovation efforts within a DOD-specific context. Understanding the change management and design thinking principles fueling project ATHENA's continued growth throughout the fleet will be important to improving the success rate of future DOD innovation efforts.

Finally, continued research into the TANG initiative is also warranted. The TANG surface event was held recently, and provides an opportunity for researchers to study the way in which the principles of design thinking and organizational change management are being applied within the surface and subsurface Navy to bring about technological innovation. These studies would provide additional macro level perspectives on change management and design thinking that would augment the micro level perspective offered in this study.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A: WIKI WARDROOM BRIEF

WIKIWARDROOM



USS BENFOLD



Atlassian

- ShipIt Days
- Quarterly Competition
- Work on anything*
- 24-hour Hackathon
 - Brainstorm
 - Build It
 - Pitch It
 - Vote



*That relates to Atlassian Products

WIKIWardroom

- Our very own Shiplt Day
- Divo duties on pause for a day
- Work on Anything*
- Your chance to “scratch the itch”
- Make it “BENFOLD Big”

*That relates to BENFOLD, San Diego or the Navy

The Rules

- Work alone, with a partner, or in a group
- Dream up an idea to improve a process, create a program or develop a new way to train
- Tuesday is all about working your idea and creating an actionable plan to make it happen
- 5-minute presentation on Friday
- Everyone has to pitch SOMETHING

When is this going down?

- Tuesday, March 12th
 - WIKIWardroom Work Day!
 - Place: Wherever!
- Friday, March 15th
 - WIKIWardroom Presentation Day
 - Place: TBD

APPENDIX B: LEARN WARFIGHTER NEEDS HANDOUT



see what co

Grassroots :
January 201

History

Blackout BING
applies to then
have all of the

-
- What t
- Who's
- What c
- last mc



E

your.

Converge

Ta



ONR Tech
but the mai

Speed to F
months – n

Lots of oth

What will it c

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF REFERENCES

- AFCEA. (n.d.). About AFCEA. [Blog]. Retrieved July 18, 2014, from <http://www.afcea.org/about/>
- Amis, J., Slack, T., & Hinings, C. R. (2004). The pace, sequence, and linearity of radical change. *Academy of Management Journal*, 47(1), 15–39.
- Bennett, A. & Elman, C. (2006). Qualitative research: recent developments in case study methods. *Annual Review of Political Science*, 9, 455–476.
- Boland, R. J., & Collopy, F. (2004). *Managing as Designing*. Stanford, CA: Stanford University Press.
- Brown, T. (2009). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. New York: HarperCollins.
- Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (3rd Edition). Thousand Oaks, CA: SAGE.
- CRIC. (n. d.). About CRIC [Blog]. Retrieved July 17, 2014, from http://www.navy.mil/submit/display.asp?story_id=76469#.U8kyCnu6fMg.gmail
- Dannemiller, K. D., & Jacobs, R. W. (1992). Changing the way organizations change: A revolution of common sense. *Journal of Applied Behavioral Science*, 28, 480-498.
- Gavin, M. A. (2013). *A Case Study for Managing Information Technology Through Design* (master's thesis). Naval Postgraduate School, Monterey, CA.
- Glaser, G. G., & Strauss, A. L. (2008). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Rutgers, NJ: Aldine Transaction.
- Hall, T. J. (2012). *A Case Study of Innovation and Change in the U.S. Navy Submarine Fleet* (master's thesis). Naval Postgraduate School, Monterey, Ca.
- IdeaFest. (n. d.). About IdeaFest [Blog]. Retrieved July 17, 2014, from http://www.navy.mil/submit/display.asp?story_id=75775#.U8kxdVONhxI.gmail
- Johnston, K. L., & Featherstone, R. W. (2014). *A Case Study of Introducing Innovation Through Design* (master's thesis). Naval Postgraduate School, Monterey, Ca.
- Kotter, J. P. (2012). *Leading Change*. Boston, MA: Harvard Business Review Press.
- LeBron, R. E. (2006). Naval entrepreneurship: the critical link in the sea enterprise anchor chain. *United States Naval Institute Essay Contest I*, 1–10

- Lockwood, T. (2009). *Design Thinking: Integrating Innovation, Customer Experience, and Brand Value*. New York, NY: Allworth Press.
- Martin, R. (2009). *The Design of Business: Why Design Thinking is the Next Competitive Advantage*. Boston, MA: Harvard Business School Publishing.
- Martin, R., & Christensen, K. (2013). *Rotman on Design*. Toronto: University of Toronto Press.
- Moore, R. (1997). Linear Growth Graph [Image]. Retrieved from <http://maths.mq.edu.au/texdev/MathSymp/Tuck/node2.html>
- Nobles, David. (2013). Project ATHENA [Blog post]. Retrieved from <http://athenavy.wordpress.com/>
- Paull, D. (2012). John Kotter's Eight-Step Change Model [Image]. Retrieved from <http://www.psma.com.au/?publication=2012-nay-gsdi13-paper>
- Plowman, D. A., Baker, L. T., Beck, T. E., Kulkarni, M., Solansky, S. T., & Travis, D. V. (2007). Radical change accidentally: the emergence and amplification of small change. *Academy of Management Journal*, 50(3), 515–543.
- Reay, T., Golden-Biddle, K., & Germann, K. (2006). Legitimizing a new role: small wins and microprocesses of change. *Academy of Management Journal*, 49(5), 977-998.
- Schein, E. H. (1995). Kurt Lewin's change theory in the field and in the classroom: notes toward a model of managed learning. *Systems Practice*, 9(1), 22–47.
- SNA. (n. d.). About SNA [Blog]. Retrieved July 18, 2014, from <http://www.navysna.org/default.htm>
- USC ICT. (n.d.). About USC ICT [Blog]. Retrieved July 17, 2014, from <http://ict.usc.edu>
- Weydert, V. (2013). Kurt Lewin's Change Model [Image]. Retrieved from https://www.digitalmethods.net/MoM/CaseStudy#_ftn5
- Yin, R. K. (2009). *Case Study Research Design and Methods*. (4th Edition). Thousand Oaks, CA: SAGE.
- Zucker, D. M. (2009). How to do case study research. *School of Nursing Faculty Publication Series*, Paper 2.

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
Ft. Belvoir, Virginia
2. Dudley Knox Library
Naval Postgraduate School
Monterey, California